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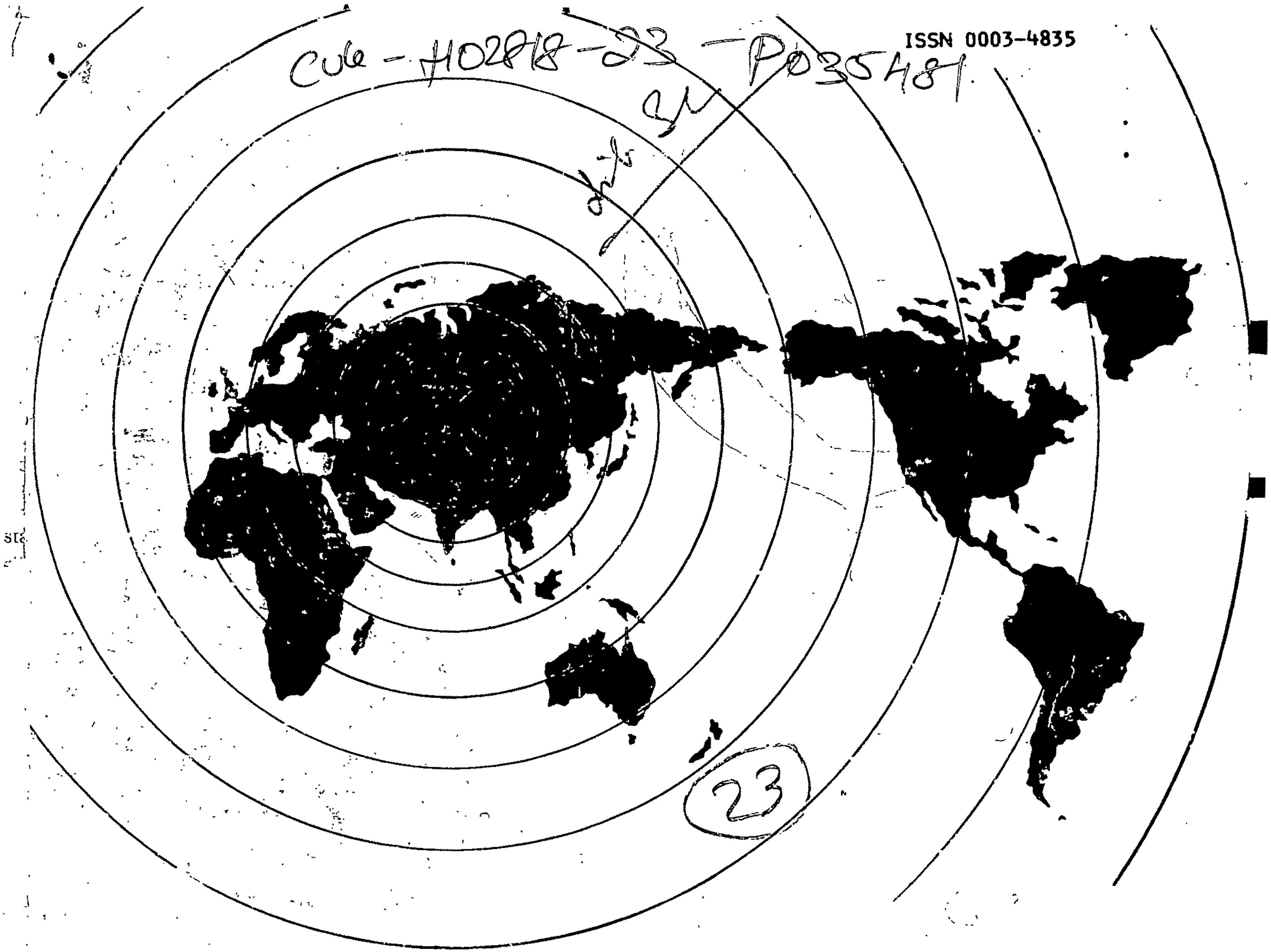

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PROVIDING INFORMATION SERVICES FOR RURAL MOBILISATION IN SPECIAL LIBRARIES FOR NATIONAL DEVELOPMENT IN NIGERIA

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P 35,481

Special library services are indispensable in the process of effective rural mobilisation for national development in Nigeria. Result of a study of Nigerian special libraries revealed features of the libraries and showed that available services in the libraries are too sophisticated for rural Nigerians. Information services for rural mobilisation as well as specialized information needs of rural Nigerians are discussed. Extension services of the Nigerian special libraries at the community or grassroot level identified as community information service is proposed as suitable for presenting specialized information to the rural Nigerians.

INTRODUCTION

Special libraries are often described in terms of the subjects of their specialisation, such as engineering, arts, transport, banking, business, etc., or in terms of their collections, such as map libraries, newspaper libraries, gramophone record libraries, etc. A special library serves a particular group of users associated with the specialized institution of which it is a part.

According to the Mass Mobilisation for Social and Economic Recovery (MAMSER) Programme Handbook [1] mobilisation is the process of pooling together, harnessing, actualizing and utilizing potential human resources for the purpose of development. It is a process whereby human beings are made aware of the resources at their disposal, and are also motivated and energized to collectively utilize such resources for the improvement of their spiritual and material conditions of living. The MAMSER Programme focuses on the ways and means of mobilising Nigeria's labour force in rural areas which is estimated to be 80 percent of Nigeria's work force to generate greater productivity to "ensure economic recovery and self-reliance".

BACKGROUND

The provision of modern library service is a recent phenomenon in Nigeria. Apart from private collections, the first known library with any kind of official or institutional support was a special library. The first Nigerian special library was the Law Library of the Federal Ministry of Justice in Lagos. It was created in 1900 for the bibliographic control of the growing colonial legal documents. Other special libraries were set up by the colonial government for its economic development. The economic activities of the colonial government were concerned with the utilization of the basic natural resources of water, soil and land. Therefore, most of the activities were agricultural, including "water supplies (domestic, industrial and irrigational), fishery, forestry, land use and soil conservation, animal husbandry and production......" [3].

Thus, there is an evidence of employment of special library services during the colonial period of exploitation of natural resources in Nigeria.

It is believed that successful implementation of the rural development programme in the present administration and realisation of the objectives of the MAMSER Programme would require a new approach for information dissemination which only special libraries can provide if properly restructured. An examination of the MAMSER handbook shows elaborate arrangement for extending information to rural communities at the grassroot level without any mention of the special library in spite of its well known potential for specialized information service. Perhaps, Nigerian special libraries have retrogressed in the services they provided during the colonial period.

It is necessary to ascertain the reason for the lack of recognition of the role of a special library in rural development programme in Nigeria. Therefore, an investigation is conducted of the Nigerian special libraries and of the available services to examine their relevance for rural mobilisation for national development.

METHODOLOGY

The investigation was limited to the study of special libraries in the government supported institutions because they are a larger group of special libraries in Nigeria. 45 major Nigerian special libraries [4, 5, 6, 7] were selected for nation-wide investigation.

Questionnaire method was used to collect information from the special libraries. This was supplemented and verified by the personal interviews with the chief librarians or documented records, particularly the annual reports of the institutions.

The questionnaires were administered personally and the interviews were conducted directly with 32 chief librarians. The remaining 13 chief librarians of special libraries, widely scattered throughout the country, were sent the questionnaires by mail. The 45 special libraries were classified into 10 categories as shown in Table 2.

Table 1.

Geographical Distribution

Sl. No.	Locations	Number of Libraries
1.	Lagos	27
2.	Ibadan	8
3.	Zaria	4
4.	Enugu	2
5.	Kaduna	2
6.	Kuru	1
7.	New Bussa	1
	Total	45

Table 2.

Subject Categories

Sl. No.	Category	Number of Libraries
1.	Agricultural	11
2.	Management	8
3.	Medical	5
4.	Socio-Economic	5
5.	Legal	4
6.	Cultural	3
7.	Financial	3
8.	Industrial/Scientific Res.	3
9.	Educational Research	2
10.	Military	1
	Total	45

ANALYSIS OF DATA

The results of the analysis of the information obtained from the respondents are presented and discussed as follows.

Geographical Distribution

Table 1 shows that 45 special libraries are clustered in seven towns and their environs. These towns are not well dispersed within the vast area of the country.

There are 27 special libraries (more than half) in Lagos and its environs, eight in Ibadan, two each in Enugu and Kaduna. Others are four in Zeria and one each in Kuru and New Bussa. Lagos was the federal capital of Nigeria, while Enugu, Ibadan and Kaduna were the seats of the three former regional governments of Nigeria. Thus the rural areas where most of the populace live are not included in the provision of special library services in Nigeria.

Subject Categories

The categorisation of the special libraries given in Table 2 shows that there are 11 agricultural, 8 management and 26 other libraries.

Most of the management or administrative libraries are located at the seats of various administrations including the colonial administration.

Subject Coverage

Nigerian special libraries were established as the supporting units to the programme of their parent institutions. The acquisitions and documentation activities, are therefore, determined by the objectives of their parent institutions. Thus, each special library specializes in a particular narrow subject area most relevant to the needs of its parent organisation.

Services

There are 14 types of documentation services available in the 45 Nigerian special libraries. 38 (84.44%) special libraries are offering reference service. Circulation of books and dissemination of currently published information (SDI service) by publishing library bulletins or accession lists are offered by 36 (80%) special libraries. SDI by personal notification, compilation of bibliographies and information services are offered by 32 (71.11%) libraries. Literature search is offered by 27 (60%) while files of information are maintained by 22 (48.89%) special libraries.

Routing of periodicals is done by 20 (44.44%), filing and indexing of internal reports by 18 (40%), indexing and abstracting services by 14 (31.11%), maintenance of special subject references with indexes by 13 (28.89%), editorial assistance for publication by 12 (26.67%), and translation services by 10 (22.22%) special libraries.

INFORMATION SERVICES FOR RURAL MOBILISATION

Aboyade [8] has shown the need of the Nigerian residents in the rural areas for specialized information. But the available information services in Nigerian special libraries are too sophisticated for the estimated 80 percent of the over 110 million Nigerians residing in the rural areas. More than 75 percent of the rural Nigerians are engaged in agriculture and related activities such as livestock, fishery, forestry, etc. The rural Nigerians are mostly illiterate and the information which would be most valuable to them is of the type which is closest to the point of application, set out in a manner which shows the advantages of application and presented in their local languages. There is the need, therefore, for the Nigerian special libraries to evolve new information services specifically designed to meet the specialized information needs of the rural Nigerians.

SPECIALIZED INFORMATION NEEDS OF RURAL NIGERIAN

The specialized information needs of rural Nigerians are associated with various models of integrated rural development categorized by Idachaba [9] as practised in Nigeria. They include information on measures to ensure increase in farm productivity and income. This requires provision of information on fertilizers, seeds, pesticides, farm equipment and machinery, availability of agricultural extension staff and their role as a link between agricultural researchers and the rural farmers, government programmes for provision of rural infrastructures such as feeder roads for access to both farm inputs and outputs, agricultural credit facilities and the contribution of the rural Nigerians themselves which would enhance successful implementation of government programme of rural development.

The rural Nigerians also require specialized information regarding social amenities such as water supply, health and medical care, education, telecommunications, rural electrification schemes, etc. to enhance the quality of rural life. Other specialized information needs are about government programmes to mobilize rural Nigerians for increased political and social participation from local to the national level as enunciated in the MAMSER, better life for rural women and other similar programmes. The aim is to raise their political, economic and social awareness, ensure active representation of rural interests on the national scene, particularly ensuring their involvement on matters and decisions affecting their well being.

It would enable them to benefit more from the government and the voluntary agencies development programmes and reduce the present human migration to the urban areas. Appropriate information services to the rural Nigerians would enlighten them to aspire for better life.

EXTENSION SERVICES OF NIGERIAN SPECIAL LIBRARIES

Extension services of the special libraries at the community or grassroot level, identified as community information services, appears to be a viable option to satisfy the specialized information needs of the rural Nigerians. Community Information Centres should be established in rural areas. with the objectives to provide specialized information at the grassroot level. These centres would constitute the primary level of the planned integrated functional nation-wide special library service.

It would ensure that required information is available in appropriate form at the grassroot level throughout the country.

CONCLUSION

A multi-level system of special library service in Nigeria will ensure adequate provision of specialized information throughout the country at all societal levels. At the primary level, community information centres to be established in every community would provide specialized information needs of each community in the most useful form.

The community information service would reflect the main occupation in each community; provide information to enlighten the residents on the political and social situation in the country as well as support rural development programmes of Nigerian government and other voluntary agencies. If properly implemented, community information service would provide the opportunity for Nigerian special libraries and the rural Nigerians to contribute meaningfully to the programme of rural mobilisation for national development.

REFERENCES

1. Mamser handbook, Abuja. Directorate for social mobilisation, 1988, 24.
2. Adefidiya -AkpatK A A : Law library, Federal Ministry of Justice, Lagos. Lagos lib 1968, 3 (3), 27-29.
3. Plumbe W J : Presidental address. Nigerian Lib 1965, 1 (4), 156-165.
4. Ogunsheye F A: Nigerian library resources in science and technology, Ibadan. Institute of Librarianship, University of Ibadan, 1970, 44 (Occasional paper no. 2).
5. Aboyade B O: Survey of Nigerian library resources - A project report on behalf of the National Library Advisory Committee on Library Cooperation, Lagos. National Library of Nigeria, 1979, 82 (National Library publication No. 44).
6. Oguara E T A: Special libraries in Nigeria - Situation and outlook in development. Nigerian Lib 1975, 11 (3), 185-212.
7. National Library of Nigeria: Official diary, Lagos. National Library, 1990, 7-16.
8. Aboyade B O: Making the library relevant in a non-literate society - the fu-

ture of library and information services in Nigeria. Paper presented at the 21st annual conference of the Nigerian Library Association, Ibadan, 5-7 December, 1983. (unpublished).

9. Idachaba F S: Concepts and strategies of integrated rural development, lesson from Nigeria, Ibadan. Ibadan University, Department of Agricultural Economics, 1980. (Food Policy Tech- nical Research Paper No. 1).

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ADOPTION OF INFORMATION TECHNOLOGY BY AGRICULTURAL LIBRARIES IN INDIA

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INTRODUCTION

India's rural population consists of farmers (52%), farm labourers (30%), artisans and others (18%). Out of them, 73% are illiterate and engaged in farming and allied activities. On the other hand country's population is multiplying at an alarming rate. The world Bank forecasts that today's 850 million population of India will be 1000 million in 2000 A.D. and is expected to be more than that of China by 2025 A.D. The cultivated land per person has shrunk from 0.17 hec. in 1980 to 0.15 hec. to-day and is expected to drop below 0.13 by 2000 A.D. To meet the unprecedented demand for food, productive agriculture must continue to increase the farm output, raw materials, etc. to make an efficient use of the resources [1]. During 1991-92, the Government of India spent through ICAR 351.81 crores of rupees, including 180.1 crores on agricultural research and education under its plan budget [2]. Agricultural research, education, transfer of technology, communication and extension activities have to be visualised in terms of return for a given investment in each field.

AGRICULTURAL RESEARCH AND TRANSFER OF TECHNOLOGY

Bunting says that westernised style of information service is not practicable in Indian conditions. ICAR being the apex body has developed a well grid two tier National Agricultural Research System (NARS) of Cooperative Agriculture consisting of research institutes, project directorates, agricultural universities and All India Coordinated Research Projects (AICRPS) for agricultural research, education and extension for the promotion and adoption of improved technology keeping in view the prevailing agricultural conditions and vast illiteracy in the country (Table 1) [3].

Out of these 361 NARS institutes, 209 agricultural and professional institutions produce 12,341 graduates including 8805 undergraduates and 3534 post graduates every year.

For transfer of agricultural technologies, the first line projects are Krishi Vigyan Kendras (KVK), National Demonstration Programmes (NDP), Operational Research Projects (ORP), Lab-to-Land Programmes (LLP) and Projects for SC & STs (Table 2). [4]

Central and State Government's, voluntary organisations and commercial agencies introduced a series of measures from time to time for dissemination of farm information in their own farming systems. The farm information units attached to various institutes and mass media also play a vital role in speedy transfer of farm technology to help and achieve productivity on agricultural front. ICAR has the responsibility for the development of agricultural manpower in India. India has the largest number of scientific and technical manpower in the field of agriculture (Table 3) working in the ICAR institutes, State Agricultural Universities (SAUs) and other R & D Departments [5].

There is an urgent and imminant need of the exploitation of integrated research to attain the optimum level of productivity. Research and communication are two components of one system. While the research involves diffusion of new ideas, knowledge and technology, the communication is the transfer of information from one source to another.

One of the objectives of ICAR is to act as a clearing house of information, i.e. to establish and maintain a reference and research library to fullfil the information needs of agricultural research workers of the country. Since 'Information is Power', it is utilised extensively by researchers, scientists, academicians, policy-makers, decision-makers, extension workers, farmers, industrialists and others to increase the production in all areas of agriculture. However, ICAR library remained as a department library and was unable to fulfil the information needs of agricultural scientists of the country. Though ICAR has developed a strong National Agricultural Research System (NARS) with a large infrastructure, it could not, so far, establish a National Agricultural Information System or an Agricultural Information Net-Work.

Table 1.

National Agricultural Research System in India

A : Indian Council of Agricultural Research (ICAR) System		
ICAR Institutes	=	45
Project Directorates	=	9
AICRPI	=	76
National Research Centres	=	26
B: State Agricultural Universities (SAU) and Colleges		
Agricultural Universities	=	27
Agricultural Colleges	=	178
Total	=	361

Table 2.

Agricultural Projects

1.	KVKs	=	109 (+74 new KVKs sanctioned during 1991-92)
2.	NDPs	=	48 (with 4065 Demonstrations during 1991-92)
3.	ORPs	=	400 approximately
4.	LLPs	=	104
5.	SC & ST projects	=	26

Table 3.

Manpower in Agricultural Research Services

		ICAR	Univ. & State Govt.	Total
1.	Scientists	6,480	24,000	30,480
2.	Research Managers	97	500	597
3.	Technicians (qualified graduates)	3,381	4,800	8,181

The IARI library having the largest and the richest collection in the country, is providing information support to the scientists working in IARI and other departments in the country.

AGRICULTURAL LITERATURE OUTPUT

Second half of the 20th century has been an era of exponential growth of scientific literature. However, it has been growing since 1665 at an annual rate of 5 to 7 percent. According to Dr. Stephen P. Lock, the editor of British Medical Journal, 1,00,000 titles, the estimated number of scientific journals, publish around 3-4 million papers every year. Agriculture, being a multi-disciplinary subject, has an extremely wide range of literature of potential importance to the scientists working in the field. The research contributions in agriculture and allied fields is also fairly high. On the basis of various published secondary sources, namely, Biological Abstracts, Biological Abstracts/RRM, Chemical Abstracts, Bibliography of Agriculture (NAL), Agrindex (FAO) and CABI Abstracting Services, the published literature is estimated to around 5 to 7 lakh documents each year including 1 lakh books/monographs, ad-hoc reports, reviews, proceedings, etc.

In India, the output of agro-biological literature is estimated to be about 25,000 papers published in about 500 journals and 300 monographs, proceedings, reports, etc.

This overflow of literature has created a sort of information crisis, which has to be handled by the library and information scientists who process and manage the literature in a fashion that ultimate user gets the required information easily.

STATE-OF-THE-ART OF AGRICULTURAL LIBRARIES

"Libraries are not mere store houses, they are springs of knowledge, which flow out to irrigate the wide fields of education and culture", said Dr. S. R. Ranganathan. Today, the libraries are an integral part of our education and research system. Their main objective is to acquire, process, organise and disseminate information so that it reaches expeditiously to its potential users. In agricultural sector, the appropriate transfer of technology pre-supposes the adequate economic study of the farmers who are actual users of the technical know-how at the grassroot level. Since information is the basic resource for all-round progress in agriculture, the librarians and information scientists have to utilize the modern information technology to support education, research and extension systems, production of goods and services for the community, all of which go to improve the quality of life. However, the information infrastructure in India has not grown to the extent it should have been. Most of the libraries, particularly in the field of agriculture, still follow the conventional methods of dealing with information, even though the expertise to adopt and absorb modern information technology is not lacking in the country.

In December 1991, the IARI library had conducted a questionnaire survey of ICAR institutes and agricultural university libraries. Questionnaires were sent to 26 agricultural universities and 40 ICAR institutes. Out of which 16 university (62%) and 34 institute libraries (85%) responded. The picture does not seem to be very bright in terms of collection, subscription, budget and manpower. In ICAR institutes, it represents a more gloomy picture. On an average 26 Institute libraries have less than 2 professionals, 10 libraries have one, 9 libraries have 2 and 7 libraries have 3 professionals each. The book collection varies from 1,00,000 (IARI Library) to 597 (National Bureau of Animal Genetics, Karnal). The periodical volumes vary from 3,00,000 (IARI) to 200 (CIAE, Bhopal) and current periodical titles from 5,000 (IARI) to 38 (NBAG, Karnal). Similarly the budgets for books/journals also vary from 7 percent (CMFRI, Cochin) to 1.34% (CIBA, Madras). In agricultural university libraries the book collection and current titles are comparatively more, their budget ranges from 8% (HPKV) to 0.4% (BAU, Ranchi), similarly SAU libraries (75%) had more specialised collections than those of institute libraries (70%). Ten libraries (29%) do not provide any documentation or current awareness service. Eleven libraries (32%) claimed to have automation facilities and 25 libraries (73%) provide photocopying facilities. The university libraries have slightly better book collection, budget, manpower and services, i.e. photocopying (93%) and documentation or CAS services (75%). 87% university libraries have compiled catalogue of journals/theses and books as against 91% of ICAR libraries, for bibliographical control of literature in their holdings [6].

LIBRARY INFORMATION SERVICES

The basic objective of library services is to provide required information to its users - the policy-makers, the decision-makers, the res- earchers, the teachers, the scholars, the extension workers, the literate and progressive farmers, etc. The service is given to the distant library users by repackaging of published information. A few ICAR institutes and SAU libraries are providing various library and information services, The data given in Table 4 reflect that ICAR/SAUs scientists, teachers and research workers are not well motivated and provided with current agricultural information.

The majority of the libraries are not providing any bibliographic or current awareness service. ICAR institute libraries (65%) and SAU libraries (82%) did not claim to have any computer application.

This pathetic state is due to the following:

a) poorly managed libraries,
b) lack of agricultural information system or, agricultural libraries network and
c) lack of a National Agricultural Information Policy.

DATABASES IN INDIAN AGRICULTURAL LIBRARIES

Some of the ICAR institute libraries have taken initiatives in creating databases in their respective areas of research, such as, CTRI on tobacco, NDRI on dairy, CPCRI on plantation crops, JTRI on jute and sunhemp, CRIDA Hyderabad on dryland agriculture, etc. CPRI Simla has created a machine readable database on potato comprising over 6,000 references from 1900 to date, IARI library has also installed two PC-386/ATs and one PC-286/AT and has converted all 1635 secondary sources into machine readable form. Further, CGIAR depository publications are in the process

Table 4.

Information Services

Sl. No.	Kind of Service	ICAR Institute Libraries (34)	%	SAU Libraries (16)	%
1.	Reprography	25	73%	15	93%
2.	List of Periodicals	3	8%	3	18%
3.	List of Additions	8	23%	8	50%
4.	Indexing to Current-Periodical Literature	6	18%	4	25%
5.	Subject/Topical bibiliography	2	6%	2	13%
6.	Current Contents	9	26%	3	18%
7.	Press Clippings	2	6%	Nil	-
8.	Abstracts Services	4	12%	Nil	-
9.	SDI	1	3%	Nil	-
10.	Library Bulletins	9	26%	2	13%

of computerisation. IARI Library has also built a bibliography of Indian agriculture on card form since 1944 which contains 1,50,000 references. ARIC of ICAR has created a database of ad-hoc research projects.

Among the SAUs only APAU (Hyderabad) reported the use of CDS/ISIS software. Bio Informatics Centre (BIC) of the Department of Biotechnology (Govt. of India) housed within the IARI library premises has created a database on plant tissue culture, photosynthesis and plant molecular biology. This is to emphasize that it is pre-requisite for agricultural libraries to creat machine readable databases in standard format for computer networking at local, regional and national levels. With the decision of Dr. N. Seshagiri (the Director-General of National Informatics Centre) to make Indian databases available on CD-ROMs, it is essential for the agricultural libraries to equip themselves by adopting the modern Information Technology to the maximum to create the databases in machine readable form.

CONSTRAINTS IN APPLICATION OF INFORMATION TECHNOLOGY

The use of computers started in 1950's and during the last four decades they underwent rapid technological developments from digital to super computers. Micro chip technology gave tremendous computing power, working speed and accuracy in personal computers. Magnatic tapes, Floppy-diskettes and CD-ROMs provided large data storage capacity and retrieval facilities. Telecommunications provided opportunities of linking personal computers with distant computers at local, regional, national and international levels. Indian as well as international markets are flooded with PCs, and software. Databases are available for search globaly through vendors like DIALOG. Why are the agricultural libraries in India not coming forward to make the best use of the whole system? Possibly they are facing some constraints as follows:

Language Problem

The agricultural libraries in India are getting maximum journals in foreign languages including English. In various states of India, the medium of teaching is regional language, particularly Hindi in northern states. Therefore, agricultural literature is also being published in various regional languages which is equally used by the farmers and researchers. The computerisation and repackaging of such information may be posing a problem and needs attention.

Role of the Government and ICAR

Government of India does not have any National Agricultural Information Policy. ICAR has also not developed any agricultural information system or network or any central node for coordinating agricultural information activities in the country. In the absence of such policy, objectives or guidelines, the librarians have no way, but to follow the traditional course.

Library Budget

UGC, as a norm, has recommended 6 percent of the working budget of the university for all-round development of libraries. Unfortunately no library, perhaps, is getting its full budgetary allocation. ICAR agrees in principle for 3% of budget allocation, but there is no consistency. It varies from institute to institute.As described earlier one ICAR library gets 7% and the other only 1.3% of the budget. Even the IARI library, the largest among the agricultural libraries gets about 1.5% of the budget. This budget allocation covers other contingencies also. The libraries have inadequate physical facilities, collection and manpower. Thus budgetary constraints do not encourage and motivate the librarians to modernise the libraries.

Training of Library Staff

In view of inadequate funds to the libraries and the budgetary restrictions on expenditure by the government, the library staff, generally, is not deputed to attend professional conferences/seminars and workshops, where they can get better exposures to new vistas in library science and information technology (IT). IT has recently stepped in the thresholds of Indian library and information field. Several organisations are conducting training courses in computer application, soft-ware development and their use. Deputation to such courses will definitely prepare the staff working in agricultural libraries to work in new environment of automation and networking.

STANDARDISATION OF BIBLIOGRAPHIC DATA

Libraries maintain their bibliographic records on catalogue cards and generally, they follow different catalogue codes, classification schemes and subject terms/key words. For computerisation or conversion of library data into electronic form, there is a strong need of standardisation in data description. Removal of vagaries and inconsistency is pre-requisite. The voluminous records need to be rendered in standardized form by adopting compatible standards for cataloguing and terminology.

MOTIVATION OF LIBRARIANS AND INFORMATION SCIENTISTS

The achievements of targets set for all round agricultural research and development, depends on the information support to the scientists. Therefore, a National Agricultural Information System (NAIS) parellel to the National Agricultural Research System (NARS) is imperative for agricultural research in India. Present infrastructure of agricultural libraries is not strong enough to promise such information support to the scientists. It needs to be improved and strengthened. Motivation of human resource is a must. Generally, libraries do not get much support and encouragement from the government and the management. In addition to the orientation and improvement in the academic and professional skills of librarians, they must be given status, emoluments, benefits and incentives equal to those of the scientists, teachers and others in the same organisation.

CONCLUSION

It is "better late than never". Since published literature is increasingly made available on CDs, Floppies/Diskettes, etc., the agricultural libraries can not afford to lag behind in their procurement and use. The procurement of publications in electronic media will save a lot of storage space and give the facility of rapid access and search of voluminous data. A speedier CAS/SDI service can also be provided to the scientists. The cost of journals and scientific books is increasing enormously. The libraries are facing severe budgetary constraints and not able to develop a need-based minimum collection to fullfil the information needs of their clientele. Hence, there is an emergent need of networking of libraries for sharing their resources to meet the information requirement. The DELNET is an example in this direction. It proposes to save more than 75 lakh rupees on periodicals subscription. The constraints in computerisation of bibliographic data and the problems, which may arise out of networking may be discussed and thrashed out at professional, institutional and governmental levels.

REFERENCES

1. International Fertiliser Association: Sustainable agricultural systems for the 21st century. Paris, April 1992.
2. India, Ministry of Agriculture: Annual report, 1991-92.
3. Association of Indian Universities: University handbook. Ed. 25, New Delhi, Ass Indian Univ, 1992.
4. India, Ministry of Agriculture: Opcit.
5. Raman K V: Management of human resources in agricultural research-a report. The Hague, ISNAR, 1986; 87-89
6. Indian Agricultural Research Institute: Survey of Agricultural Libraries, 1991.
7. BIOSIS: Catalogue of Information and Products, 1992.
8. CABI News., May 1992.
9. Gore Jr A: Next information revolution. The Futurist. Jan-Feb. 1991; 21-23

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USING BARCODE FOR CIRCULATION IN THE CENTRAL LIBRARY OF IIT BOMBAY

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INTRODUCTION

The Barcode Technology was introduced in the library of IIT Bombay in August 1991. Learning from the experience elsewhere was not possible as no information on the use of the technology in a library, particularly of the size of IIT Bombay, was available. The existing literature on the state of the technology in Indian libraries was too scarce in the first place. Secondly, it was not necessarily relevant in the context of large libraries. There was, a spate of literature discussing 'barcodes' at the theoretical level. But it was hardly useful for taking a crucial decision of introducing the technology in the environment prevailing in the country. The present study, therefore, will be useful for the librarians of large libraries who may be planning to use the technology. It may be stated that ever since its introduction, the technology has never failed and has been yielding the desired results.

BARCODE SYSTEM

The circulation function of the library of the IIT Bombay had been computerised well before the barcode system was introduced. On an average approximately 500 books are issued out of the library everyday and an equal number of books are returned. As examinations and semester-ends approach, the number of transactions rise to 1600 per day. The transactions are not evenly distributed during the working hours from 09.00 to 18.00. At certain hours of the day, for example the lunch time, there is a hectic rush at the counter. Speed is what is expected at such a time. Equally important is the accuracy in the recording of transactions. (As is well known, one error in an issue transaction results into two errors automatically. A book issued to a wrong reader does not get issued to the right reader). The computerisation of circulation function is based on the digits making up the accession number on one hand and the borrower's number on the other. At the time of each transaction it is these digits that have to be keyed in. For example, a faculty member at IIT is entitled to borrow 15 books. If he/she returns 15 books and borrows another 15 books and if the accession number of the book consists of six digits and the reader's code number consists of eight digits, the number of digits that the staff at the issue counter has to key in is 8+15x6+15x6 = 188. All these have to be keyed in without any error, in the face of a possible disturbance from an often impatient reader across the counter. The minimum number of digits to be keyed in is six if the reader returns only one book. (For the return operation, the system does not require the reader's code number). The probability of error in keying in the number is no doubt very high. Added to it, is the time that is taken for keying in these many digits. The need for accuracy is very essential. It was, therefore, found necessary to adopt the technology that would not only achieve the required speed but also ensure the accuracy. Barcoding was the answer.

Barcode

Barcode is a series of black bars of varying breadths and white spaces between every two of them. The bars and spaces represent a series of characters or digits. Such types of barcodes are found in foreign countries printed on food packets, consumables, books, etc. These barcodes are readable only by a scanner which sends messages to the computer that decodifies the number of the digits. The computer identifies such bars as '0' s and '1' s (Zeros or Ones) and white blanks as "off"s or "on"s. Therefore, a barcode is a series of '0's and '1's representing characters or digits in such a form as only the computer can identify.

In order to use barcodes, it is necessary that each book or an issuable item in the library collection is attached with a barcode. The barcode needs to be printed with almost precision and pasted on a surface which is absolutely plain. It is also necessary to attach barcode to reader's tickets in the same manner. The barcodes are read either by a wand or by a laser scanner. The respective advantages of using the wand and the laser scanner have been discussed in the literature.

Issue of books : The reader wishing to borrow books presents his/her barcoded ticket along with the books. The library staff after going in for the Issue-of-Book-Menu scans the reader's barcoded ticket and opens the reader's account. He then scans the barcodes of books with the scanner. Each book thus gets automatically added to the reader's account.

Return of books : When the reader wants to return the book to the library he presents it at the counter. The library staff goes in for the Return-of-Book-Menu to record the return of the book. He scans the barcode of the book which again automatically gets fed to the computer and the book is cancelled from the issue record. (It is not necessary to have the reader's ticket while returning books). The whole transaction of returning five books and getting five books issued at the same time takes only two minutes.

The technology proved to be advantageous in two more, rather unexpected, ways. Firstly, It is common experience that in the service sector the beneficiaries have misgivings about mechanisation. The best way to win their confidence is by convincing them about the accuracy the system ensures. When the readers see that the numbers are read accurately, more accurately than even in the manual operation, it is easy to win their faith in the total process of computerisation. This was what was experienced when barcoding was used in the IIT library.

Secondly, the introduction of the technology was received as something 'great' especially by the younger generation. The students felt "proud of their library because of the most modern technology being used in it.

IMPLEMENTATION

It is one thing to identify the useful technology and quite another to implement it. There are managerial, administrative and financial problems. It was, however, experienced that the financial problem was not as formidable as it appeared initially. Funds were assured soon after the authorities recognised the benefits of the technology, of course, with a friendly warning to be as economical as possible. The problem of selecting the technology did not arise, as only one vendor in the market offered this technology and it proved, to the relief of all concerned, to be reasonably satisfactory. Thus the major problem was managerial. The task was to assign barcodes to 2,40,000 volumes of books and serials, and 4,500 reader tickets without a single error. The crucial issues were :-

a) This was to be done with minimum interruption in the circulation service.

b) It had to be ensured that the new accessions would be barcoded during the period the project was on.

c) It had to be seen that after this operation was over the barcoding function would be integrated into the routine activities of the library so that the barcoding of the new books as well as of the tickets of new members would be continuously done.

d) Provision was to be made for generating and providing barcodes for the existing books and reader's tickets in case they got soiled, lost or incorrectly printed.

Several alternatives were available for each stage of the implementation. These are described in the latter part of this paper. After assessing these alternatives in the context of the prevailing conditions the implementation strategy was finalised. It was thought appropriate to test the viability of the system and so a pilot project was designed and launched.

PILOT PROJECT

The vendor was requested to provide his barcode scanner for the pilot project. Five hundred books belonging to the library science collection and seventy library staff members as readers were selected for the pilot project. Staff for the project was drawn from among the data entry operators and attendants and the computer time from the existing resources. Barcodes were generated and the strips were pasted on to the books and reader's tickets. Issue and return of these books was carried out during the specific time during the day. The resources in terms of the time, manpower and stationery were measured. The technique adopted was evaluated. The distances in transport of books were measured and movement of personnel was observed and analysed. The time taken for the issuing and returning of books was measured. So was checked the accuracy in transaction. The pilot project was spread over a period of one month. The results of the pilot project were consolidated and accordingly the final operation was planned.

ALTERNATIVE STRATEGIES FOR IMPLEMENTING THE TECHNOLOGY

Strategy One - By Accession Number

It is possible to generate the barcodes by accession number at once and attach them to the books on the shelves. This, however, presents the following problems:

a) Since books are arranged by class number, it is a very complicated and time consuming exercise to locate the barcode strip of a given book from a whole lot of preprinted barcodes.

b) It is also not considered advisable to record author and the title or part thereof on the barcode to avoid a possible mismatch.

c) Because of the two different sequences, one of the books on the shelves and the other of the barcodes in hand, it is impossible for more than one person to work simultaneously.

d) It is difficult to identify the books whichmight be subsequently shelved after the barcoding is done.

This process, thus, creates more problems than it solves.

Strategy Two - By Class Number

It is possible to generate the barcodes by class number to match the existing arrangement of books. However, this process also creates its own problems.

a) Shelf arrangement is not necessarily always by class number. A lot of segregation perforce takes place in a large library. As a result, a lot of running after the books will be involved.

b) In an open access system, books get misplaced due to browsing by readers. Thus it may take a lot of time to locate many books.

c) Several books are likely to be out in circulation. It is a difficult task later to match the returned books with pregenerated barcodes.

d) Some books might have been lost, mutilated or withdrawn from circulation. Barcode generated for such books may create a problem.

e) Due to heavy handling involved in this process, the barcode labels are likely to be mutilated which may cause problems in scanning in the future.

f) The pasting of barcodes is an endless job and remains unaccomplished for a very long time.

Thus, whole process takes a lot of time and involves increased costs.

Strategy Three - In Shelflist Order

Since the shelf list corresponds with the arrangement of books on the shelves, the barcodes can be generated using the shelflist cards. They can then be distributed to different groups who go on pasting them on the books in the shelves at different points in the library simultaneously. This strategy is also beset with problems.

a) There are two prerequisites- The shelf list must be properly maintained and the books must remain in place for a reasonably longer time. The later, is difficult to ensure particularly in an open access library.

b) The barcode has to be printed along with class number, author mark and accession number for identification of book the shelf.

c) Books which are out on loan and those which are being consulted are difficult to handle. If the number of such books is very large, special attention required to handle them may consume a lot of time and energy. Preservation and instant retrieval of barcodes of such books need special attention.

Strategy Four - Barcoding Individual Books at Hand

In this method, individual books from the stack room and the returned books from the issue counter (before shelving) are brought to a work station set up for the project. Each book is handled separately. A barcode is generated for the book in hand and pasted in the work room itself. The book is then sent to stack room.

In this method, the book is handled individually which makes a thorough checking and rechecking. This reduces the chances of error to the minimum, in fact, nil. As all books are sent to barcode workstation there is no possibility of leaving any book without a barcode. Following are some of the problems and precautions to be take care of in this process.

a) Special care has to be taken to maintain the sequence of books when they are being carried from the stackroom to the barcode room for making their barcod tables, as also when they are carried back to the stackroom for shelving.

b) The books, which are being barcoded, are not ideally available to readers for one working day. In reality, only a fraction of these may be called for by readers.

Strategy Five - Moving the Machine Along the Rack

In this mobile operation, books remain stationary on the shelves. All mechanics, data entry operators and attendants who paste the barcode to the book are moving from shelf to shelf within the stack area. They generate and paste barcodes to the books physically present there in the stackroom. The problems involved in this area are :

a) The manpower required is high and thetime it takes is longer.

b) When the machinery is moving along the bays' it needs a long line electricity supply, rendering the process unduly cumbersome.

c) The presence of men and machinery in the stackarea is bound to hinder browsing.

Of these five alternatives, the fourth was finally selected and adopted as it offered least disturbance in the normal working of the library. Monitering the operation was easier and the chances of a chaotic situation developing in the library were almost nil.

GENERATING BARCODES FOR READERS

The clientele of IIT Library consist of the following categories of readers:

a) Institute staff
b) Students
c) Corporate members
d) Alumni
e) Retired staff

For generating barcodes it was decided to use the employee code number in the case of staff and the roll number in the case of students, both of eight digits. These eight digit numbers were not expected to be in conflict with the six-digit accession numbers. Besides, the six-digit limit of accession numbers is not likely to change for at least another twenty years.

The following alternative strategies for generating barcodes for readers were available.

Use of Personal Names

A list of all readers with their corresponding numbers (employee code, roll no., etc.) are compiled alphabetically according to the personal names. The barcode is generated in that order and pasted on the reader's tickets by inscribing their names on them. As and when the reader comes, his card is identified by his name, and after completing necessary formalities like pasting photographs, attestation, inscribing his signature, etc., the ticket is given to him. This process faces the following problems:

a) All the problems of alphabetisation and those of personal names that one come across in catalouging are faced while filing and locating the cards.

b) It is likely that all the potential readers do not enroll as users. This is especially true with the secretarial staff. To that extent,there would be a wastage of stationery.

Use of Reader's Numbers

The barcode is printed according to the reader's code number and pasted on the card. The cards are arranged by the code numbers. Since the employees and the students know their code numbers and roll numbers respectively, it is easy to identify their cards while issuing. It is possible to keep the cards in separate groups and divide the work of issuing the cards into various grpups to finish the job faster. There were, however, two problems :

a) The process depends on the reader's memory for recalling correctly his number.

b) Errors in the readers numbers during the process of barcoding may create problem.

STATIONERY OPTIONS FOR PRINTING BARCODES

It is ideal to print barcodes on self-adhesive labels with the help of laser printer to achieve the precision that is needed for laser scanner. However, this could be expansive and the quality of adhesive used for self-adhesive labels is also not guaranteed. The alternative strategy would be to print them on a reasonably good paper and paste with the help of gum or some other adhesive. This is cheaper but laborious.

LAMINATING THE BARCODED LABELS

Laminating the barcoded labels is ideal. Cost permitting, it can be adopted. Alternatively, labels can be pasted inside the book on the title page and near the date slip at the end to provide the necessary protection to barcodes.

FINDINGS OF THE PILOT PROJECT

The pilot project confirmed the following :

a) The issue and return of the books were easier and speedier.

b) Scanning of barcodes was easy and accurate.

c) Barcoding was the logical extension of existing automation of circulation in the library.

d) The misuse of the library facility was automatically checked. [In the earlier issue system in which presentation of reader's ticket was not obligatory there was scope for impersonation which was a major problem at the issue counter].

e) During the implementation, the pilot project also revealed the followings :

   i) One data entry operator (DEO) can enter the required information at the rate of 40 books per hour. Thus, it can reasonably be expected that one DEO can handle 250 books per day.

   ii) The printer takes 10 to 15 minutes for printing 200 barcodes (that is for 100 books, if barcodes are to be attached at two places for one book). This provides a key to working out the computer time for this operation.

   iii) One sheet of 80 columns of paper can accomodate 30 barcodes (for 15 books).

   iv) One attendant can cut and paste barcodes for 40 books per hour.

These findings were helpful in planning the final project.

NEED FOR TAKING UP THE PROJECT

It was obvious that barcoding 2,40,000 bibliographic items and 6,000 reader's cards was an additional work for the library. It could not be done by stretching the existing resources of the library.

Additional provision had to be made for manpower, material and machines. It was necessary to design a time bound programme to complete the operation. It was also necessary that during this operation the normal work of the library should not get affected. For all these reasons it was necessary to take this allocation as a project by itself with the required resources.

DESIGNING THE PROJECT

From among the various strategies described above those that were found to be most appropriate were adopted after considering the organisational, technological, financial constraints, and the demands of the library service. Following decisions were made for successful completion of the project:

a) Generating the barcodes and pasting them on each item must be done simultaneously. The book would be retained in the work station as long as it is required for generating its barcode and pasting it.

b) Each book would have the barcode at two places, so that if one gets soiled the other would be available for laser scanning.

c) Books would not be retained for the purpose for more than one working day.

d) The books which were being returned by the readers would be barcoded on priority basis.

e) Small workstation would be set up where generation of barcodes and their pasting would be done. The books would be transported to this workstation.

f) It was decided to see that the transport of books would consume less staff, time and energy and would not disturb readers and the staff in the stack area.

g) To ensure accuracy in the barcodes, it was decided to do checking at least four times during the procedure.

h) 1,000 volumes would be barcoded in a day.

i) The whole operation was to be completed within the period of 11 months.

j) It was decided that the Assistant Librarian (circulation) would monitor the work for books and the Assistant Librarian (journals) for the back runs of serials.

k) Following records would be maintained every day :

- Number of books brought to the work station
- Number of books entered for barcoding
- Number of books for which barcodes are generated
- Number of books for which barcodes are pasted
- Number of books which have been sent back to stacks after barcoding
- Stationery consumed
- Computer consumables used
- Stock provision of the consumables required for the next few days
- Manpower used during the project

LAUNCHING THE PROJECT

Staff

It was decided to employ four data entry operators and four attendants for the project. The staff required for the other services in the operation would be drawn from the existing human resources of the library.

Hardware

Following hardware were made available for 11 months:

PC -	Five [four stand-alone for keying in and one for printing.]
Printers -	two [the second was a stand-by to keep the work going undisturbed]
Laser - scanners	two

Software

Software for generating barcode was supplied at cost by the vendor who supplied the scanners.

Stationery and other requirements were acquired as given in Table 1.

OPERATION PROPER

The work started in the month of February 1991. It was carried out on the working days during the working hours. The six book trolleys were utilised for transporting books from the stacks in the library. The personnel for transport of books from and to the work station were also drawn from the existing staff.

The books returned at the issue counter on the previous day were taken up first for barcoding. They used to be around 500. These books were treated during the first half of the day. In the second half, the books standing on the shelves were being taken for barcoding. The books were first handed over to the data entry operators who entered the data (Acc. No., Author- Title combination not exceeding 30 characters) and kept them in the same order as they were entered. After entering about 500 books, the barcodes were generated.

The barcodes were then pasted on respective books in an assembly manner and the books were kept in the same order as they were received at all stages. The completed lot would be carried the next day morning to the shelves. At this stage also the attendants would have a quick glance to check whether the right barcode is attached to the book by quickly checking the author/title and accession number (also printed on the barcode) of the book.

Throughout the period the average turnover of 1,000 books/items was maintained and the project was completed one month in advance, i.e., in 10 months.

The only snag in the procedure was that the books in circulation which were to be barcoded on a priority basis irrespective of their classificatory order had to be transported to the work station twice. But it was inevitable.

New books that were being added during the period of operation were treated as the books returned at the issue counter. Thus, the barcode

Table 1.

Stationery and Other Items Required for Barcoding

Stationery	Quantity
Better quality paper for printing barcode	20,000 sheets
Floppies	2 boxes
Ribbions	100
Tables for Pc's and chairs	7
Big tables for cutting and pasting	2
Cutting knives	1 Dozen
Glass sheets for cutting	2
Scales	6
Paste	10 liters
Book trolleys	6
Empty racks	4
Scissors	2
Soap	-
Dusters	2 Dozen
Napkins	-
Stools	4

Table 2.

Cost Involved in Barcoding

Equipment	
Two Scanners including installation and maintenance and excluding custom duty.	Rs. 75,000
Computer time for 5 PCs and 2 printers for a period of 10 months	Rs. 35,000
Software for generating barcodes	Rs. 8,000
Manpower	
Four data entry operators	Rs. 60,000
Four Attendants	Rs. 46,200
Hidden cost of two attendants and one supervisor	Rs. 30,000
Hiring charges	
6 book trolleys	6,000
7 computer tables	8,750
2 big tables	1,000
5 computer chairs	3,750
4 chairs/stools for attendants	1,800
4 single sided book racks & book support	4,000
Stationery & Consumables	
Paper	5,000
Electricity Charges	16,500
Cutters (4) and blades (4 dozen)	600
Paste	1.000
Foot rule steel (big size)	200
Glass sheet	500
Computer Ribbons	24,625
Dusters	200
Soap	200
Napkins	250
2 boxes of floppies	1,200
Misc.	1,000
Total	3,30,775
Rounded to	3,31,000
Items (books which were barcoded)	2,40,000
Unit Cost	Rs. 1.38 per item

for them got generated automatically and pasted. After the operation was over the work of generating the barcodes was made a part of the responsibility of Technical Processing Section where the classification and cataloguing are done alongwith the pasting and writing of labels and book pockets. The section was given a PC and printer alongwith the software for printing barcodes.

COST

A rough estimate of the cost is presented in table 2. It is worked out as per the prices, salaries as well as the exchange rates prevailing in 1990-91.

CONCLUSION

The technology is performing well and is found satisfactory for both the readers and the library staff. While greater efficiency is evident on the inner side of the counter, an equal amount of satisfaction is visible on the other side of it. While achieving one of the major objectives of library service, the staff shares with the readers the pride and pleasure of taking a stride towards the modernization of one principal library in the country.

Another observation is that the barcode technology may not be cost-effective in small libraries with a small number of borrowers. It may, however, be worth introducing in a library where integrated computer-aided library management is in operation. The total cost in that case would get distributed and benefits, however intangible they are, will get enhanced.

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CITATION PROFILE OF DR. V. S. RAMACHANDRAN - A BIBLIOMETRIC ANALYSIS OF HIS HIGHLY CITED ARTICLES AND BOOKS IN THE AREA OF CEMENT AND CONCRETE CHEMISTRY

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The citation pattern of the citations received by the works of Dr. V. S. Ramachandran with special reference to his highest cited articles and books, is studied.

INTRODUCTION

A survey of the cement research literature for ten years (1975-1984) conducted by the American Ceramic Society and reported in its annual publication "Cement Research Progress" 1985suggested that there were atleast 10,600 cement researchers in the world with atleast one research paper each to their credit. In those ten years Dr. V. S. Ramachandran was the nineth most quoted author.

This prompted the authors to study the cited works of Dr. V. S. Ramachandran. Two articles and two books, cited maximum, are studied in detail for citation analysis in the area of cement and concrete chemistry, a sub-field of building materials.

Table 1 gives the break-up of entire work of Dr. Ramachandran consisting of 161 publications comprising papers published in various Indian and foreign periodicals and those presented in conferences, the chapters in various books, the books published by the reputed publishers of the world, NRC, Canada publications, client reports and other publications. There are 19 papers published in Indian periodicals and 84 papers in foreign periodicals. Sixteen papers were presented in various national and international conferences. 49 papers published in the learned journals also form the part of the study.

Table 2 shows the break-up of publications under various categories of documents, number of papers and percentage of the works. It is seen in the table that 52.2% and 11.8% of documents were published in the foreign and Indian periodicals respectively. 3.7 and 9.9 percent papers were presented in national and international conferences. Six books formed 3.7 percentage of the entire work. The table indicates that most of the work was published in foreign publications.

METHODOLOGY FOR CITATION ANALYSIS

For studying the citation counts for 49 articles, the data was collected from the volumes 1955-64, 1965-69, 1970-74, 1975-79 and Annual 'CITATION' cumulation volumes for the years 1980 to 1990 (April only) of the "Science Citation Index". under "Ramachandran, V.S.".

DATA ANALYSIS

The break-up of 45 papers and 6 books has been tabulated in Table 3. and Table 4, Table 3 indicating the life span and frequency of citations per paper.

An article published in 1971 was cited 15 times during the span of 18 years and it is expected that the life span of the article may be even longer. This clearly showed that the research is almost of continuous importance. Similarly, another article published in the year 1971 was also cited 11 times during the span of 1970-1989 and was cited seven times during the years 1975-79. It may be expected that these two articles might be cited in future as well which establishes that the life span of an article cannot be ascertained so easily.

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Table 4 shows the life span of each book and the frequency of citations to it. The citations to 5 books of Dr. V. S. Ramachandran were recorded. It is observed that two books were cited 26 times and 19 times respectively.

Table 5 shows the distribution of articles on the

Table 1.

Year-wise Break-Up of Publications

	Papers	Published in	Journals		Other	Publications						
Sl.No.	1 Year	2 No. of Papers	3 Indian Periodicals	4 Foreign Periodicals	5 Pub. in Int. Conf. Proc.	6 Pub. in National Conf.Proc.	7 Books	8 Chapters in Books	9 NRC Canada IRC Div.Pub.	10 Client Reports	11 Other Publication	Total
1.	1952	3	3	-	-	-	-	-	-	-	-	3
2.	1953	1	1	-	-	-	-	-	-	-	-	1
3.	1954	2	2	-	-	-	-	-	-	-	-	2
4.	1955	-	-	-	-	-	-	-	-	-	-	-
5.	1956	-	-	-	-	-	-	-	-	-	-	-
6.	1957	2	2	-	-	-	-	-	-	-	1	3
7.	1958	-	-	-	-	-	-	-	-	-	-	-
8.	1959	1	1	-	-	1	1	-	-	-	-	3
9.	1960	2	2	-	-	-	-	-	-	-	-	2
10.	1961	6	1	5	-	-	-	-	-	-	-	6
11.	1962	2	1	1	1	-	-	-	-	-	-	3
12.	1963	2	1	1	-	-	-	-	-	-	-	2
13.	1964	9	1	8	1	1	-	-	-	-	-	11
14.	1965	3	-	3	-	-	-	-	-	-	-	3
15.	1966	3	1	2	-	-	-	-	-	-	-	3
16.	1967	3	-	3	-	-	-	-	-	-	-	3
17.	1968	6	2	4	-	-	-	-	-	-	-	6
18.	1969	2	1	1	1	-	1	-	-	-	-	9
19.	1970	-	-	-	-	-	-	-	-	-	-	-
20.	1971	6	-	6	1	-	-	-	-	-	-	7
21.	1972	4	-	4	-	-	-	-	1	-	-	5
22.	1973	4	-	4	-	-	-	-	-	-	-	9
23.	1974	3	-	3	-	-	-	1	2	-	-	6
24.	1975	4	-	4	-	-	-	1	-	-	1	6
25.	1976	2	-	2	-	-	1	1	-	-	-	4

Contd.

Table 1. (Contd.)

Sl.No	1	2	3	4	5	6	7	8	9	10	11	Total
26.	1977	1	-	1	-	-	-	1	-	-	-	2
27.	1978	6	-	6	-	-	-	1	-	-	-	7
28.	1979	1	-	1	-	-	-	1	1	-	-	3
29.	1980	1	-	1	4	-	-	2	-	-	-	7
30.	1981	-	-	-	-	-	1	1	1	-	1	4
31.	1982	3	-	3	1	-	-	2	-	-	-	6
32.	1983	1	-	1	-	1	-	2	-	-	-	4
33.	1984	2	-	2	1	-	1	4	-	-	-	8
34.	1985	2	-	2	1	2	-	-	-	-	-	5
35.	1986	6	-	6	2	-	1	-	-	-	-	9
36.	1987	4	-	4	2	-	-	-	-	-	-	6
37.	1988	5	-	5	-	1	-	-	-	3	-	9
38.	1989	1	-	1	1	-	-	-	-	1	-	3
	Total	103	19	84	16	6	6	17	5	4	4	161

Table 2.

Break-up of *Publications Under Different Categories of Documents*

•Sl. No.	Various Categories of Documents	Number of Publications	%
1.	Indian Journals	19	11.8
2.	Foreign Journals	84	52.2
3.	Int. Conference Proceedings	16	9.9
4.	Nat. Conference Proceedings	6	3.7
5.	Books	6	3.7
6.	Book Chapters	17	10.6
7.	NRC Canada, IRC Div. Pub.	5	3.1
8.	Client Reports	4	2.5
9.	Other Special Publications	4	2.5
	Total	161	100

Table 3.

Life Span and Frequency of Citations of Articles

Year of publication of Articles 1	No. of Articles 2	1955-59 SC 3	CO 4	1960-64 SC 5	CO 6	1965-69 SC 7	CO 8	1970-74 SC 9	CO 10	1975-79 SC 11	CO 12	1980-84 SC 13	CO 14	1985-89 SC 15	CO 16	Total SC 17	CO 18	Total 19
1954	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
1954	1	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	2	2
1959	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1
1961	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1
1961	1	-	-	1	1	-	-	-	-	-	1	-	-	-	2	1	4	5
1961	1	-	-	-	1	-	-	-	1	-	-	-	-	-	2	-	4	4
1961	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	1
1962	1	-	-	-	-	-	3	-	1	-	-	-	1	-	1	-	6	6
1963	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1
1964	1	-	-	-	-	-	2	-	1	1	-	-	-	-	-	1	3	4
1964	1	-	-	-	-	-	1	1	2	-	-	-	-	-	1	1	4	5
1964	1	-	-	-	-	-	6	-	-	1	-	-	1	-	-	1	7	8
1964	1	-	-	-	-	-	2	-	2	-	1	-	1	-	-	-	6	6
1964	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	2
1965	1	-	-	-	-	2	-	-	-	1	1	-	-	-	-	3	1	4
1967	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1
1967	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1	1	2
1968	1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	2	2
1968	1	-	-	-	-	-	-	-	-	2	-	1	-	-	-	3	-	3
1971	1	-	-	-	-	-	-	-	1	-	4	-	-	-	-	-	5	5
1971	1	-	-	-	-	-	-	-	-	-	4	-	-	1	-	1	4	5
1971	1	-	-	-	-	-	-	-	-	1	4	1	2	-	1	2	7	9
1971	1	-	-	-	-	-	-	1	2	-	7	-	-	-	1	1	10	11
1971	1	-	-	-	-	-	-	1	4	-	6	-	1	-	3	1	14	15
1972	1	-	-	-	-	-	-	-	1	-	2	1	3	1	1	2	7	9
1972	1	-	-	-	-	-	-	-	1	1	3	1	1	-	-	2	5	7
1972	1	-	-	-	-	-	-	-	-	-	3	1	-	1 (Anon.)	-	1+1 (A)	3	5
1972	1	-	-	-	-	-	-	-	-	-	5	-	1	-	2	-	8	8

Contd.

Table 3 (contd.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1973	1	-	-	-	-	-	-	-	-	1	1	-	1	-	-	1	2	3
1973	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	1
1973	1	-	-	-	-	-	-	-	-	1	2	-	1	-	3	1	6	7
1973	1	-	-	-	-	-	-	-	-	1	4	1	-	-	1	2	5	7
1976	1	-	-	-	-	-	-	-	-	-	1	1	1	-	1	1	3	4
1976	1	-	-	-	-	-	-	-	-	-	1	1	-	-	4	1	5	6
1978	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
1978	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	2	2
1978	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
1978	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2	2
1979	1	-	-	-	-	-	-	-	-	-	-	-	1	-	5	-	6	6
1980	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	1	2
1982	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1
1982	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	2
1983	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	1	2
1984	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
1984	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	3
1986	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
1986	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
1986	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
1987	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
Total	49	-	2	2	5	2	17	3	17	12	54	10	20	3+1	41	32+1	156	189

SC - Self Citation
CO - Cited by Others

Table 4

Life Span and Frequency of Citations per Book

Year of Publication	No. of Books	CITATION																Total
		1955-59		1960-64		1965-69		1970-74		1975-79		1980-84		1985-89		Total		
		SC	CO	SC	CO	SC	CO	SC	CO	SC	CO	SC	CO	SC	CO			
1959	1	-	-	-	2	-	-	-	-	-	1	-	1	-	-	-	4	4
1969	1	-	-	-	-	-	-	1	2	-	7	-	3	3	10	4	22	26
1976	1	-	-	-	-	-	-	-	-	-	1	-	1	-	4	-	6	6
1981	1	-	-	-	-	-	-	-	-	-	-	1	1	-	17	1	18	19
1984	1	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	2	3
Total	5	-	-	-	2	-	-	1	2	-	9	1	6	4	33	6	52	58

SC - Self Citation
CO - Cited by Others

Table 5

Distribution of Articles on the Basis of Citedness

Sl. No.	Citedness of Article (S)	No. of Articles	Total No. of Citations received	Cum. of Citations
1.	Cited Once	14	14	14
2.	Cited Twice	10	20	34
3.	Cited Thrice	3	9	43
4.	Cited Four Times	4	16	59
5.	Cited Five Times	5	25	84
6.	Cited Six Times	4	24	108
7.	Cited Seven Times	3	21	129
8.	Cited Eight Times	2	16	145
9.	Cited Nine Times	2	18	163
10	Cited Ten Times	0	0	163
11.	Cited Eleven Times	1	11	174
12.	Cited Twelve Times	0	0	174
13.	Cited Thirteen Times	0	0	174
14.	Cited Fournteen Times	0	0	174
15.	Cited Fifteen Times	1	15	189

Table 6

Distribution of Books on the Basis of Citedness

Sl. No.	Citedness of Books	No. of Books	Total No. of Citations Received	Cum. of Citations
1.	Cited Thrice	1	3	3
2.	Cited Four Times	1	4	7
3.	Cited Six Times	1	6	13
4.	Cited Ninteen Times	1	19	32
5.	Cited Twenty Six Times	1	26	58

Table 7.

Analysis of the Paper Published in "Thermochim Acta 1971, 2, 41-45" and Cited 11 times

Sl. No.	Year of citation	Citation		Citing Journal (s)	Citing Authors
		Self	Others		
	1	2	3	4	5
1.	1972	-	1	Analyt Chem 66, R523, 72	Murphy, C V
2.	1973	1	-	J Appl Chem 23, 625, 73	Ramachandran, V
3.	1974	-	1	J Appl Chem 24, 157, 74	Traetter, A
4.	1975	-	1	J Amer Con 50, 94, 75	Setta, P J

Contd.

Table 7 (Contd.)

Sl.No	1	2	3	4	5
5.	1975	-	1	J Amer Con 58, 87, 75	Ramdoi, L
6.	1975	-	1	J Test Eval 3, 375	Shelni, J
7.	1976	-	1	Ind J Tech 14, 389, 76	Singh, N B
8.	1976	-	1	J Sci Ind Res 35, 75, 76	Singh, N B
9.	1977	-	1	Inorg Mat 13, 1505, 77	Men, E N
10.	1977	-	1	J Appl Chem 47, 2506, 77	Chivos, H
11.	1988	-	1	Thermochim Acta 12, 89, 78	Bedant, L

Table 8.

Analysis of the Paper Published in "Materials and Structure 1971, 41, 3-12" and Cited 15 times.

Sl. No.	Year of Citation	Citation		Citing Journals (s)	Citing Authors
		Self	Others		
1.	1972	1	-	J Appl Chem 22, 1073, 72	Ramachandran
2.	1972	-	1	J Mat Sci 7, 330, 72	Berman, H A
3.	1972	-	1	Analyt Chem 4, R583, 72	Murphy, C V
4.	1974	-	1	J Appl Chem 24, 157, 74	Traefaq, A
5.	1974	-	1	Rev Chem 19, 371, 74	Theoreanu, J
6.	1975	-	1	J Amer Con 58, 87, 75	Banjok
7.	1975	-	1	J Test Eval 33, 12, 75	Canto, A
8.	1975	-	1	J Amer Con 58, 14, 75	Fres, A T
9.	1975	-	1	J Test Eval 3, 303, 75	Skalay, T
10.	1975	-	1	Thermochim Acta 12, 87, 75	Bandol, L
11.	1976	-	1	J Amer Con 59, 29, 76	Avsrov A V
12.	1983	-	1	Analyt Chem 5, 3508, 87	Issa Mqri, D
13.	1986	-	1	Cem Con Res 16, 17, 86	Brown, B M
14.	1987	-	1	J Amer Con 64, 1102, 87	Diamona, S
15.	1987	-	1	Cem Con Res 17, 907, 87	Arya, C

Table 9.

Citing Pattern of the Book "Concrete Science. London, Heyden, 1981" (Cited 19 times).

Sl. No.	Year of citations 1	Citation		Citing Journals 4	Citing Author (s) 5
		Self 2	Others 3		
1.	1983	-	1	J Mat Sci 2, 627, 83	Laus, V
2.	1984	1	-	J Chem Tech A34, 184, 84	Ramachandran,VS
3.	1986	-	1	Cem Con Res 16, 554, 86	Beaudoin, J J
4.	1986	-	1	Mag Con Res 38, 23, 86	Marsh, B K
5.	1986	-	1	Cem Con Res 16, 161, 86	Poom, C S
6.	1986	-	1	Cem Con Res 16, 207, 86	Kosger, H
7.	1986	-	1	Cem Con Res 16, 17, 86	Brown, P W

Contd.

Table 9 (Contd.)

Sl.No	1	2	3	4	5
8.	1987	-	1	Cem Con Res 17, 996, 87	Aitcin, P C
9.	1987	-	1	Mas Rev 56, 263, 87	Alla A J Pivicesh
10.	1987	-	1	J Kuwait, 14, 251, 87	Ecrayyes, M S, Jr
11.	1987	-	1	Jr Mat Sci 6, 197, 87	Beaudoin, J J
12.	1988	-	1	Mag Con Res 40, 28, 88	Hanmat, D J
13.	1988	-	1	Mat Sci 4, 277, 88	Jennings,H M
14.	1988	-	1	Mat Sci 4, 291, 88	Jennings, H M
15.	1988	-	1	Cem Con Res 18, 636, 88	Kayyali, O A
16.	1988	-	1	J Mat Sci 23, 501, 88	Henderso, E
17.	1988	-	1	J Appl Chem 61, 2045, 88	Imozemts, Y P
18.	1989	-	1	Mag Con Res 41, 171, 89	Almudaih, J
19.	1989	-	1	Mag Con Res 41, 19, 89	Penttala, V E

Table 10.

Citation Pattern of the Book "Application of Differential Thermal Analysis in Cement Chemistry. New York, Chemical Publishers, 1969" (cited 26 times).

Sl. No.	Year of citation	Citation		Citing Journal (s)	Citing Authors(s)
		Self	Others		
1.	1970	-	1	Ann Chem 44, 8168, 70	Murphy, E V
2.	1971	-	1	Mid Sci 84, 655, 71	Kenneple, N A
3.	1971	1	-	J Therm Anal 3, 383, 71	Ramachandran,V S
4.	1975	-	1	MAP Soc 1, 83, 75	Klethani, J
5.	1975	-	1	MTP Core 75, 1486, 75	Klethani, J
6.	1976	-	1	Bk No 336, 76	Fruadman, H C
7.	1976	-	1	J Amer Con 47, 1701, 76	Virobov, K S
8.	1976	-	1	J Scientific Ind Res 75, 76	Sivesh N.B.
9.	1976	-	1	J Appl Chem B.28, 159, 76	Visht, Y
10.	1976	-	1	J Amer Con 55,-, 76	Gowda, Y R
11.	1981	-	1	Rev Royal Chem 76, 1213, 81	Toreginu, I
12.	1984	-	1	Thermochim Acta 78, 101, 84	Volantie, G
13.	1984	-	1	Mag Con Res 36, 146, 84	Khoury, G A
14.	1985	-	1	Thermochim Acta 93, 69, 85	Handa, S K
15.	1985	-	1	Thermochim Acta 91, 905, 85	Bhattiji
16.	1985	-	1	Thermochim Acta 93, 613, 85	Bushnew S M
17.	1986	1	-	Thermochim Acta 106, 273, 86	Ramachandran.V S
18.	1986	-	1	Thermochim Acta 98, 71, 86	Santoro, L
19.	1986	-	1	Thermochim Acta 106, 93, 86	BhattiJI
20.	1987	-	1	Thermochim Acta 116, 145, 87	Santoro, L
21.	1987	-	1	Thermochim Acta 119, 235, 87	Bhattiji
22.	1987	1	-	Thermochim Acta 112, 252, 87	Ramachandran, V
23.	1987	-	1	Mag Con Res 39, 221, 87	Shiang, M
24.	1988	1	-	Thermochim Acta 127, 385, 88	Ramachandran,V S
25.	1988	-	1	Cem Con Res 18, 91, 88	Valantic, G L
26.	1988	-	1	Amer Ceram Soc 67, 12222, 88	Chiang, M H

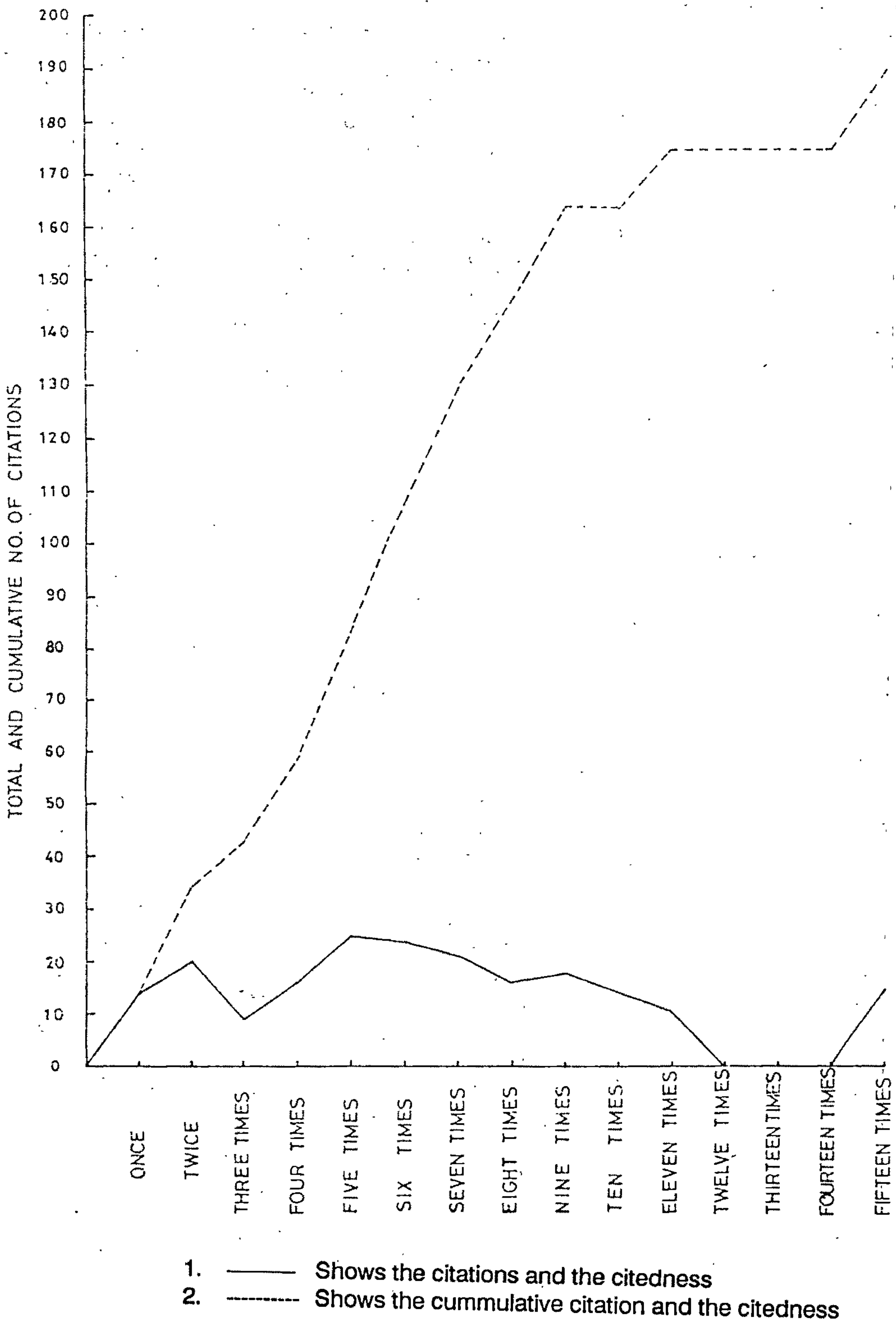

Fig. 1 DISTRIBUTION OF ARTICLES ON THE BASIS OF CITEDNESS

basis of the frequency of their citations. From the table it is observed that the article receiving 15 citations is the most cited one followed by another article receiving 11 citations. Frequency graph of rated citations is also plotted [Fig. 1] indicating the citations and cumulative number of citations for articles authored by Ramachandran. Similarly, Table 6 records the distribution of books on the basis of citations. The table shows that the books were cited 4 to 26 times.

It is considered worthwhile to study in detail the citation pattern of articles which received maximum number of citations.

CITATION ANALYSIS OF HIGHLY CITED ARTICLES

Table 7 illustrates the details of citation pattern of the article published in Thermochimica Acta Vol 2 (1) pp. 41-45 (NRC No. 11676), 1971. The article was cited 11 times. The journal is covered by SCI data base. It was first cited one year after its publication and continued to be cited a number of times after 1,2,3,4,5,6 and 18 years. The article was cited three times in the year 1975 and two times in 1976 and two times in 1977. There was no citation for ten years and again in 1988, the article was cited leading to the fact that the life span of any article can not be determined firmly. The article was cited three times by the Journal of Applied Chemistry and twice by the Journal of American Concrete Institute.

Table 8 gives an account of the pattern of citations to an article published in Materials and Structure in 1971. The article was first cited one year after its publication. It was cited 15 times in 16 years. It was cited a number of times after 1,2,3,4,5,12,15 and 16 years of its publication. The article was cited three times in 1972, twice in each 1973 and 1974, five times in 1975 and once in 1976. The article was again cited after the lapse of 7 years and the trend of its citation continued upto 1987 when it was cited twice.

It is inferred that the work is expected to get more citations in future.

Unfortunately, this journal is not covered in SCI database. Therefore, its coverage in the SCI database is strongly recommended.

CITATION ANALYSIS OF HIGHLY CITED BOOKS

Dr. V. S. Ramachandran had authored 6 books. Five books were studied for bibliometric analysis. Two of them which are highly cited by the fellow scientists are analyzed below:

The book titled "Concrete Science" received as many as 19 citations. It was quoted by various scientists working in the field of concrete technology which is a fast developing field in building materials. The citation profile of the book indicated that it was well cited. It was cited a number of times after 2,3,5,6,7 and 8 years of its publication in 1981. (Table 9).

The book was first cited just 2 years after its publication and it was cited 5 times in 1986, 4 times in 1987 and 6 times during 1988 which shows that it was continuously cited. Cement Concrete Research cited the book 6 times and Magazine of Concrete Research 4 times. Table 10 records the citation pattern of the highest cited book. The title of the book is "Application of DTA in Cement Chemistry". It is published by Chemical Press, New York in 1969. It was immediately cited once after the publication of the book in 1970.

The book is cited a number of times after 1,2,6,7,12,15,16,17,18 and 19 years of its publication in 1969, i.e. 5 times in 1976, 3 times in 1985 and 3 times in 1986, 4 times in 1987 and 3 times in 1988. It is observed that the book was cited constantly.

CONCLUSION

From the above study it is clear that Dr. Ramachandran is one of the highly quoted scientists in the area of cement concrete chemistry. He was more quoted for his books in comparison to his articles.

It is suggested that a survey similar to the one carried out during 1975-1984 may be conducted by the American Ceramic Society. This survey is very much due for 1985-1991 which may throw some more light on the citedness of the works of Dr. V. S. Ramachandran.

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LIBRARY AUTOMATION AND NETWORKING IN INDIA - AN OVERVIEW OF RECENT DEVELOPMENTS

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INTRODUCTION

This paper presents an overview of recent developments in library automation and networking in India and raises issues believed to be of basic nature as a contribution to the on-going debate and discussion on the subject in the country.

LIBRARY AUTOMATION IN INDIA - THE LAST 10 YEARS

The main players in the area of library automation in recent years have been special libraries of the country. These libraries/documentation centres are in the R&D institutions under the Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR) and the Defence Research and Development Organization (DRDO). Notably, libraries belonging to the private sector and public sector industrial R&D organizations such as BHEL and Steel Authority of India Limited (SAIL) and international organizations such as International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) have also made useful contributions. In fact such libraries have provided the leadership and have become training grounds for other libraries.

Considerable impetus to the use of new information technologies in special libraries has been provided by the support that the Department of Scientific and Industrial Research (DSIR) has extended to the Sectoral Information Centres established in some of the CSIR laboratories under the auspices of the National Information System for Science and Technology (NISSAT). NISSAT has also funded several training programmes and software development projects which have played an important role in improving awareness of new technologies and their potential, and in transfer of skills and software to different special libraries in the country. Understandably, the emphasis in most of the special libraries has been on database development and information retrieval services.

With the exception of a few university libraries such as those of IIT Kanpur and Hyderabad University, the university sector has not been very active. Unlike the UK or US, academic libraries in India are not in the forefront of developments and innovations in the application of new information technologies.

Furthermore, there is no evidence of any activity, nor of any planning for the introduction of new technologies in the Indian public library system.

Several factors have favoured the adoption of new technologies in special libraries. Most of them are in publicly funded organizations and they function relatively autonomously and so decision making is easier. Secondly, special libraries are under pressure to deliver more efficient services and to provide better and wider access to information. Thirdly, The wide availability of personal computers has undoubtedly contributed to special libraries being able to automate their functions and to build specialized databases. One factor that has probably made the greatest contribution to automation in special libraries in India is the free availability of Unesco's Micro CDS/ISIS and the relative ease with which a specialized databases can be developed.

Unlike special libraries, academic libraries in India function in a relatively less autonomous environment; They have to compete for scarce resources; They are by comparison small units within a large organization; Undergraduate students outnumber the graduate students and the faculty and research staff; and as a pressure group, undergraduate students do not have a great stake in improved library services. In general, these libraries do not seem to be under pressure to improve their services as much as are the special libraries.

However, the University Grants Commission (UGC) in 1989 took the initiative to plan for a country-wide academic library and information network called INFLIBNET, and this is referred to later in this paper. This initiative has the potential to make a significant impact on operational efficiencies and user services in libraries in general and academic libraries in particular.

LIBRARY AUTOMATION SOFTWARE

In the last few years, there have been some important and useful initiatives in the development of library automation software. Some special libraries notably at BHEL R&D [4], SAIL, ICRISAT [2], INSDOC, NIC, Defence Scientific Information and Documentation Centre (DESIDOC), IIT Kanpur, etc. have successfully developed software for library automation. Understandably these centres have concentrated on developing applications which are important in their specific environments, and where they pay off in terms of better control, new services, or more efficient operations. Book and serial acquisition, computer assisted cataloguing, union catalogue production, SDI, and current-awareness are some of the areas where applications are developed.

In addition to the efforts at the above mentioned centres, CMC Ltd., a public sector computer company has built an integrated software package called MAITRAYEE suitable for a library network [4]. This package will be applied in CALIBNET, a network of libraries in Calcutta. It is yet to be observed how the package will be received and used.

More recently, DESIDOC [3] has built an integrated application using Micro CDS/ISIS which is a major contribution in enabling small libraries in the country to realise the benefits of automation. More over, the use of public-domain software like CDS/ISIS and common standards for database creation, bibliographic description, indexing and classification, etc. act as a catalyst to improve sharing of resources among libraries in India. This requirement is becoming more and more important in view of the erosion in the purchasing power of libraries and fall in the value of the rupee vis-a-vis hard currencies.

CDS/ISIS is also used for the development of other utilities. One such example is the development at ICRISAT [5] of a general purpose program for the production of SDI outputs based on stored

Commercial Software

Significantly, in the last few years there has been tremendous development of commercially available software for library automation. LIBSYS [7], and TULIPS - among the better known commercial packages - are available for use on microcomputers, minicomputers and mainframes, and in LAN environments. One measure of the maturity of these packages is that they are written as applications under well known Database Management System (DBMS) packages, e.g., Oracle, Ingres, etc. Most of them are offered as integrated library management packages. There is now considerable experience in their use, which has enabled developers to enhance their first offerings.

There are some differences between the features of these packages and those of the GEAC or VTLS which are developed in the west. Firstly, none of the Indian packages, with the exception of the MAITRAYEE, fully support machine-readable catalog (MARC) records. It may not, currently, be significant in India, but it will definitely be of significant importance when the large libraries, such as universities libraries, begin to retrospectively convert their catalogues into machine-readable form. The need to access MARC records on CD-ROM or other media and to restructure such records for use in local systems will undoubtedly become apparent. Similarly, the need to prepare for co-operative and shared cataloguing of Indian publications and for accessing current cataloguing information on external networks will make it essential for locally or commercially developed software to be capable of using MARC records. Secondly, Indian packages have attempted to offer more than library automation. For instance, they have attempted also to be information retrieval systems. Some of the systems also allow entry of information on serial articles, chapters from books and other analytics. They also provide SDI capabilities. Such a facility on the face of it is good but the packages in question may not always adhere to the internationally accepted standards for such types of documents. also, it is naive to think that libraries, however large they may be, will, on their own, be ble to provide comprehensive information retrieval and dissemination services relating to world-wide periodical and specialized literature. Access to external databases and information retrieval systems would still be required. It would be interesting to find out to what extent the information retrieval capabilities of commercially available Indian packages are in fact being used.

Thirdly, the packages in the west are increasingly emphasizing the incorporation of end-user friendly interfaces, and the provision of on-line public access catalogues (OPACs). Indian packages, however, are still oriented mainly to be used by librarians and information specialists and not by the occasional end-user student, teacher, researcher, etc. However, the question of OPACs in India at the moment is an academic one since the computing power and telecommunications facilities required to provide OPACs is considerable and not yet available to the libraries in India.

Considerable research is continuing in the US and UK on the design of friendly interfaces including the use of artificial intelligence and graphical user interfaces (GUI). Developers of library automation software in India will hopefully take note of such developments in their software development work.

Relevance of Integrated Library Systems in India

Integrated systems in the west recognize the centrality of the cataloguing record in library operations. Automation of acquisition, cataloguing, circulation, reference and information retrieval functions are dependent on the capture of cataloguing records and access to them. The information infrastructure of the west is built to ensure that the libraries of all types have wide and easy access to the cataloguing data.

Data networks ensure that access to such data is reliable and cheap. The MARC record produced not only by the national library but also cooperatively by several others is the kingpin in the whole process. Libraries in the west have a long history and tradition of centralized, cooperative and shared cataloguing, and adherence to common standards in classification, cataloguing and indexing. Professional manpower is expensive and the larger libraries in the west have dedicated minicomputers or mainframes for library automation. Smaller libraries including special libraries have access to computing power and the auxiliary special libraries have access to computing power as well as to auxiliary storage capacity either on mainframes of their parent bodies, or on their own PC-based local area network (LAN).

Integrated library management software in the west is designed to take full advantage of this infrastructure, and the emphasis in a library that acquires and uses an integrated software package is firstly, on the cost-effectiveness with which a publication can be acquired, processed and made accessible to users including access on an OPAC, and secondly, on the speed with which both the bibliographic record and document can be shared by other libraries.

In India, on the other hand, key elements of the infrastructure that make for the effective application of an integrated library management software package are missing. For instance the library utilities like an Indian MARC which the libraries can subscribe to or access on-line to obtain cataloguing data on Indian publications including those in Indian languages, are not available. Thirdly, unlike in the west few libraries can afford to own mainframes or minicomputers dedicated to library automation. Libraries in India simply do not have a culture of shared and cooperative cataloguing. In short, the objectives of using integrated library management software packages in India at the moment are not the same as those in the west. Within-the-library also, integration of functions is not often possible because the different functional units of a library - acquisition, cataloguing, reference, circulation - normally do not have concurrent on-line access to the databases and authority files that constitute an integrated application. Such access is possible only if a library has several terminals to a mainframe or minicomputer or has a dedicated LAN of its own. Even where a library has access to a mainframe or minicomputer (e.g. in the universities' R&D Institution), the disk space that is available for library applications is simply inadequate for a proper integrated application. This is because the library has to compete with other departments for limited computing and related resources. Only when libraries improve the quality and efficiency of their services will their bargaining power for more resources improve. it appears that libraries in India will do well to concentrate on tasks that have a direct bearing on user services rather than on increased operational efficiency. If this be so, should libraries invest in costly integrated library management software? Is there a role for special purpose software with a clear perspective for integration at a later date when other elements that make for effective integration become available? For instance, is it an accident that university libraries in the west automated their circulation systems before they thought of automating their cataloguing or acquisition systems?

As in the manufacturing industry, so in the information industry, the capital expenditure on building the appropriate infrastructure in a developing country generally falls to the government of the country. This infrastructure in the form of better communication networks, facilities for database development, easier access to hardware and software, etc., is now slowly being built in India.

The recent liberalization of India's investment and economic policies will no doubt provide a further impetus for private sector investment in information technology and its applications.

Effective utilization of this infrastructure is the responsibility of individual libraries of all types. This means that libraries in India should give the highest priority to improving their services and ensuring easier and wider access to documents and information for their users. The only way libraries in India can cope up with the rising costs of informational material and increased demands from users is by better coordination, cooperation and sharing of resources with libraries having similar interests. The networking of libraries and the application of new technologies for this must get high priority. A vital pre-requisite for networking is agreement and conformity to common standards for library processes. Furthermore, there is need for a greater commitment to the sharing of bibliographic records as well as the documents and their copies. India has not been very good in sharing of resources. This is partly due to the lack of initiatives on the part of librarians and partly due to the lack of policy support to encourage libraries to share their resources with others. Technology alone cannot help bring about the required changes. Attitudes, practices and policies need to change if libraries in India are to truly benefit themselves and their community of users by the application of new technologies.

The questions arise now : Is the western model of library automation and networking relevant to India in its present state of development?, If so, to what extent?, What are Indian professionals doing to make the benefits of automation and the application of new technologies flow not only to libraries but also to the users of all kinds?, How can other technologies (e.g. optical disks) be used to further the goals of better service? What roles should the national libraries, professional bodies and the schools of library science play in ensuring effective use of new technologies?, How are the decisions on building of the information infrastructure being influenced and implemented? Is there a role for the publishing industry and the book selling trade?, etc.

LIBRARY AND INFORMATION NETWORKING IN INDIA

A distinction is made here between infrastructural networks and application networks. The former are those that provide the hardware, software, protocols, and freeways for the free flow of information. Application networks are those which are set up by or for a specific community (librarians, bankers, etc.) or for a specific community using the infrastructure to serve well defined end-users. In the last few years, there has been considerable thinking and investment in the development of infrastructural networks.

INFRASTRUCTURAL NETWORKS

Public Packet-Switched Data Network

The Department of Telecommunications has established this year (1992), a nation-wide public packet-switched data network (PSDN) called I-NET which will have nodes in 8 cities connected through high speed (9600 and 64000 bits per second) links. I-NET supports CCITT standard protocols/interfaces : X.3, X.28, X.29, X.25 and X.75. It is accessible using dedicated or leased lines for asynchronous (X.28) or synchronous (X.25) connection with standard modems/ drivers. I-NET is ideal for users whose data traffic does not justify a dedicated network. Databases when mounted on I-NET hosts are of great interest to the library community. Electronic mail is also possible on I-NET. Further, it also provides international connectivity to important data networks outside the country through the GPSS (Gateway Packet Switched Services) of the Videsh Sanchar Nigam Limited (VSNL), India's overseas communication services at Bombay, Madras and Delhi. PADS (Packet Assemblers/Dis-assemblers) at these cities ensure access at 300-2400 bps to the gateway and to external networks.

I-NET and the GPSS have ushered in an era of relatively inexpensive and reliable computer communications in India and it is now up to the library and academic community to take advantage of these facilities. Library networks using a combination of dedicated lines and dial-up access connections using the infrastructure of I-NET are a distinct possibility and one can look to the future of library networking in India with hope.

NICNET : A unique infrastructural network with a history that goes back to 1970's is the National Informatics Center's (NIC) network called NICNET. It is unique in the sense that it uses almost exclusively, satellite-based communications using low cost roof-top micro-earth stations to connect 450 district headquarters and 32 state and union territory capitals with a central hub at Delhi. Another unique feature of NICNET is that it uses 500 very small aperture terminals (VSATs), each of which is connected to a specific outbound and inbound channel on the satellite's transponder. Data transmitted by a VSAT is received and relayed via the satellite (INSAT 1D) to another VSAT, all of which are addressable. Both individual and group addressing of VSATs is possible. VSATs have been used to connect computers, terminals, telexes or other devices to each other via the satellite. With this technology, it is possible even for remote corners of the country to be connected without recourse to telephone lines, multiplexers, modems, etc.

NICNET has large mainframes at four cities in the country with supermini computers at the state capitals and union territories, all linked via the VSATs and satellite.

NICNET is designed primarily to be a government information network. Its objectives are to promote the collection, storage, analysis, transmission, and exchange of data at districts, state headquarters and central ministries and departments at New Delhi for use in planning, management, and monitoring of projects and government sponsored programmes. It has been used extensively during the emergencies caused by natural calamities and to obtain help and information in health and agriculture related areas.

Although NICNET is principally meant for use by the Government departments, it does have the potential for use by the library and information community. It is possible to mount databases on one or more of the mainframes of NICNET for online access by users in government departments, research institutions supported by the state or central government etc. The Indian MEDLARS Centre (IMC) of the NIC has mounted the MEDLINE database on one of NIC's minicomputers at Delhi and this is remotely searchable using dial-up access from NICNET terminals throughout India. In addition to the MEDLINE database, IMC provides dial-up access to CD-ROM databases of the US National Library of Medicine, and to Biological Abstracts and the Science Citation Index.

An example of how NICNET has been used to mount an application network is seen in the Biotechnology Information System (BITS) of the country. This network initiated in 1986 under the auspices of the Department of Biotechnology of the Government of India, operates through nine centres known as Distributed Information Centres (DICs), affiliated to University Departments or research centres under the CSIR or ICMR and specializing in an area of biotechnology. The DICs are charged with the responsibility of developing bibliographic and nonbibliographic databases in their areas of specialization and to provide computer-based access to users of such information in the country. Further, the DICs are expected to provide access to biotechnology information elsewhere in the world through collaborative and cooperative programmes including the exchange of data, databases, and mutual access to such information. Each of the DICs is a NICNET node and hence all the DICs are interconnected for mutual access to databases and have the facility of E-Mail. Further, each of the DICs may possess specialized databases on CD-ROM which can be remotely searched throughout the country. The DICs also provide access to specialized software useful in biotechnology research and development. Since NICNET was designed primarily for government use, the extent to which it will be available for library networking and for access to public databases is not yet clear. Once traffic on NICNET becomes heavy, it may not be able to service the library community and information users among the general public as effectively as one would desire. NICNET will, however, keep abreast of new technologies in satellite-based communication and therefore the library community in the governmental sector should stake its claim to use NICNET wherever possible.

INDONET : INDONET is a commercial distributed computer network to provide access to the considerable computing and software resources of CMC Ltd., a public sector company in India. The objective is to provide computing power and software to users who cannot afford or fully justify investment in dedicated hardware and expensive, specialized business and scientific software. INDONET has three IBM mainframes at Calcutta, Bombay and Madras and smaller computers at Delhi and Hyderabad. The network uses dedicated lines operating at 2400 to 4800 bps. It has plans to use roof-top antennas and packet-switching for data routing within the nodes of the network. Intra-city access to INDONET computers via line-of-sight pocket radio is also being investigated. The Bombay node of INDONET is connected to VSNL's GPSS enabling computer-to-computer communications via networks abroad. INDONET also has plans to mount public databases on one or more of its computers. However, the costs of using INDONET will probably preclude its use by the library and information community to any appreciable degree, especially since cheaper alternatives have become available.

APPLICATION NETWORKS

In the last three or four years there have been considerable activity for planning and building of library and information networks. Three major efforts to network libraries in the country are briefly described below. An attempt has also been made to raise questions believed to be important for the future of library networking in India.

INFLIBNET : INFLIBNET [8] is envisaged as a computer-communications network linking libraries in universities and colleges in the country and libraries in institutions affiliated to the CSIR, ICMR, ICAR, DRDO, and Government departments. When full fledged, it is envisaged that INFLIBNET will network 184 universities and 23 institutions deemed to be universities, 6100 colleges and over 200 libraries affiliated to other organizations.

INFLIBNET is being planned as a multi-service network and will provide catalogue-based services, access to databases and document supply services, and facilities for computer mediated communications such as E-Mail, conferencing, bulletin board, etc.

INFLIBNET is designed to operate at four different levels, viz., national, regional, sectoral and local. The National centre will coordinate the activities and services of the network and provide the policy frame. Regional centres in the north, east, west and south of the country will be established in designated university libraries in different regions. These will maintain regional union catalogues. Sectoral centres will be at specialized institutions, e.g. CSIR laboratories. The sectoral centres will create and maintain databases in specific disciplines or missions. End-users will be serviced at the local level, i.e. colleges, R&D centres, university libraries, etc. About 400 local nodes are proposed to be set-up initially. In addition, INFLIBNET proposes the establishment of 100 document resource centres in different universities and R&D centres. These centres will be the focal points in a country-wide document delivery service.

The network will use both satellite-based and terrestrial communication channels for connectivity. The system will have 400 ground terminals at 150 university libraries, 50 autonomous colleges and 200 other centres. Intra-city links will be provided via local area networks.

INFLIBNET is expected to evolve standards based on national and international practices for uniform adoption throughout the network.

INFLIBNET as conceived is undoubtedly a bold initiative that the UGC has taken. The magnitude of the effort envisaged can be seen by the expenditures that are estimated. A capital expenditure of Rs.1030 million and a recurring annual expenditure of Rs. 477 million is the estimated need. Further, it is envisaged that the whole expenditure on capital goods and services required and working capital will be provided by the Central Government.

It is vitally important for the future of library and information networking in India that INFLIBNET succeeds in its mission to improve interactions among academic and research libraries in the country for the efficient and effective sharing of resources, databases, information, document delivery and other services for the benefit of the library, student, teaching, and research communities in the country as a whole.

However, there has not been enough debate and discussion about the conceptual and physical design features of INFLIBNET among its important stake holders, viz., the library community of the country. The following comments and observations are offered as a contribution to the discussion from the perspective of this author.

INFLIBNET has followed a typically top-down approach to network planning. A few specialists comprising senior librarians, systems analysts, administrators and telematics professionals met in Delhi over a period of three months in 1988 to formulate the INFLIBNET plan. Such an approach could not have taken into detailed account the ground realities in a large country such as India. However, given the need to make a quick headway into networking, a top-down approach was probably the best way to make an initial plan, which at best can be thought of as a macro-plan. Refinement of the plan and its implementation, however, would need to take into account the realities of the situation in different parts of the country. More importantly, commitment to the plan not only from the librarians but also from the top managements of the different institutions to be involved in the network needs to be obtained. Unfortunately, there does not seem to have been any attempt at micro-planning required at the different institutions so that they could in turn take up suitable activities within their own organizations. Also, although the plan is more than three years old, not much has been done to build awareness among librarians and to get their input into ways of implementing different components of the network. As of now, university and other librarians do not seem to be clear about their roles and the kinds of investments in equipment and software, training and staff skills they would need in order to become full-fledged participants of the network.

Another problem with INFLIBNET is its ambitiousness. The investments envisaged seem to be far more than what the University Grants Commission (UGC) or Government of India can provide during the Eighth five-year plan. This has apparently necessitated rethinking on the outlined activity plans. The sheer size of the plan and the ability/willingness of the Government to commit resources needed, lead one to ask if it would not have been wiser to start on a smaller scale and build incrementally in the interest of the sustainability of the whole project and providing proof of the workability of ideas and methods envisaged in the plan.

It is probably pertinent at this stage to look at the experience of the United States in library networking. Butler [10] writing as far back as 1975 on the state of networking in the US identified three factors that aid or hinder library network development. The factors listed below were seen to be predominant in the success of the networks in the US.

a. A Network's development time in planning is inversely proportional to the number of skilled, experienced library planners involved the minimum number which is two.

b. Network development is inversely proportional to the time required to produce the first network product, i.e., the longer the network group is required to support development without production of a valuable output, the less likely it is that the network will survive.

c. Network development is directly proportional to the level of funding and centralized administrative management. That is, money is significant, and there must be a strong central administration - which means decision making power and management which includes planning, development, and marketing the network's functions.

As it is presently conceived, INFLIBNET combines in itself both the functions of a library utility (e.g. Online Computer Library Center) and that of a consortium of libraries (e.g. Southern Libraries Network). Some members of the network will probably have to provide utility services (e.g. production of catalogue cards for members) in addition to serving their local clientele. This could lead to inefficiencies on both fronts due to equipment, staff or managerial difficulties. An alternative would have been to set up a commercial or quasi-commercial agency which would specialize in providing utility-based services. This would leave libraries to concentrate on their main functions, viz., acquiring and processing documents, servicing the users and more importantly to engage in cooperative acquisitions, resource sharing within the consortium. Such an approach would help strengthen links that already exist between libraries of a region or sub-region or discipline, and the more successful of these would be models for other consortia. Coordinating a well defined group of libraries with shared interests is probably more feasible and manageable than coordinating a heterogeneous group of libraries.

INFLIBNET envisages a hierarchical model for the computer-based communication paths in the network. For instance, a college library will be linked to the university library which in turn will be linked to the Regional Centre and Sectoral Information Centres. The possibility of multilateral communication, the essence of computer-based networks, is possible but only via the central hub in New Delhi, since the whole network is envisaged as a star configuration, except in the large cities where libraries are to be linked by a terrestrial local area network. As it is presently conceived, it appears that multilateral communication in most cases will be only for message transfer and not for database access. Such an approach would probably be adequate to begin with but as more and more libraries become computer-proficient, libraries will begin to look for more autonomy in computer use, database development and access to external databases. Such a phenomenon in fact has occurred in the west and this is well described by Hildreth [10, 11]. It is important to consider how we might cope with such a situation.

DELNET : DELNET is one of the two experiments that is now on-going in the country to network libraries in big metropolitan cities. These experiments may provide guidelines for the city-wide sub-networks envisaged in the INFLIBNET project.

DELNET will network 35 libraries in Delhi area [12]. A packet-switched network is envisaged with each cluster of libraries being serviced by a packet-switching exchange. Participating libraries have begun creating databases of their monograph and serials holdings using CDS/ISIS. Records are in conformity with the Common Communications Format (CCF). A union catalogue of serials has been created and is available at one of the libraries in the network. All databases created co-operatively are expected to reside on a central computer system and dial-up access will be provided to all participating libraries. In addition, the network will have E-Mail, file transfer and bulletin board facilities.

CALIBNET : CALIBNET will network 38 science and technology libraries in the Calcutta Metropolitan area. The plan is for the introduction of automated systems in the participating libraries before networking them. Each of the libraries is expected to automate their book acquisitions, cataloguing, serials control, fund accounting, and circulation control. It is not clear, however, if all the libraries will use the same software package, viz. MAITRAYEE. The network centre will provide on-line access to the network's union catalogues and current-awareness services including SDI. As with DELNET, each cluster of libraries will be serviced by a packet-switching exchange.

Libraries participating in CALIBNET will use AACR-2 for bibliographic description. The software, MAITRAYEE supports MARC records and will also enable records to be imported/exported via the CCF format. CALIBNET will be linked to DELNET via dial-up access and to external networks via the GPSS.

Both DELNET and CALIBNET are in the initial stages of development and the experience gained by the libraries and software developers in these two networks will undoubtedly be very valuable in similar work that will be taken up elsewhere in the country.

CONCLUSION

A review of the kind attempted here cannot capture the buoyancy and enthusiasm that is evident today among librarians in the country. There is a distinct sense of urgency and an eagerness to get things done. There have been impressive gains in the skill-base of the library profession. More and more professionals today, compared to even three or five years ago, are becoming not only computer-literate but quite proficient in systems analysis, programming, and the application of new tools and techniques for library management, and information retrieval. There is today a greater appreciation among library professionals of what the new technologies can and cannot do. Librarians who were once extremely wary of computers are today willing to burn their fingers. All this can only augur well, and give hope of steady progress in the challenge of utilizing new technologies for better access to knowledge and information in the country's thrust towards greater academic, economic and social progress.

REFERENCES

1. Haravu L J, Reddy S K, Satyanarayana V V V and Savale V T: Computer applications to library and information work at the Technical Information Centre, BHEL Corporate Research and Development Division. Annals Lib Sci Doc 1985, 32 (1/2), 41-49.
2. Haravu L J, Jadhav P S and Sreeramana R: A microcomputer-based book acquisition system in India using dBase II. Program 1987, 21 (1), 37-48.
3. DESIDOC Software Team : Sanjay - augmented CDS/ISIS package for library automation. NISSAT Newsletter 1991, 91 (3), 3-6.
4. Tagore P, Ghosh K, Basak B, Banerjee T, Dey S, Dutta Sen R and Ghosh D: MAITRAYEE - Library computerisation and networking software. NISSAT Newsletter 1991, 91 (3), 7-9, 15.
5. -: Mini/Micro CDS/ISIS Pascal program for SDI at ICRISAT. ASTINFO Newsletter 1990, 5 (2), 9,1.
6. Haravu L J and Venketasan V : Union catalogue of serials in International Agricultural Research Centres (IARCs) database manual. Patancheru, A.P. 502324, India, International Crops Research Institute for the Semi-Arid Tropics 1990, 68 pp.
7. LIBSYS - an integrated library management software package. NISSAT Newsletter 1989, 8 (3), 9-14.
8. Universsity Grants Commission : Development of an information and library network. Report of the Inter-Agency Working Group. New Delhi: University Grants Commission, 1988, 475 pp.
9. Butler B: State of the nation in networking. J Lib Automation 1975, 8 (3), 200-220.
10. Hildreth C R: Library networking in North America in the 1980's. Part 1: the dreams; the realities. Electron Lib 1987, 5 (4), 222-228.
11. Hildreth C R: Library networking in North America in the 1980's. Part 2: the response of bibliographic utilities to local integrated systems. Electronic Library 1987, 5 (5), 270-275.
12. Viswanathan T, Mittal R and Lakshmi V V: Library networks in India. Annals Lib Sci Doc 1991, 38 (2), 39-52.

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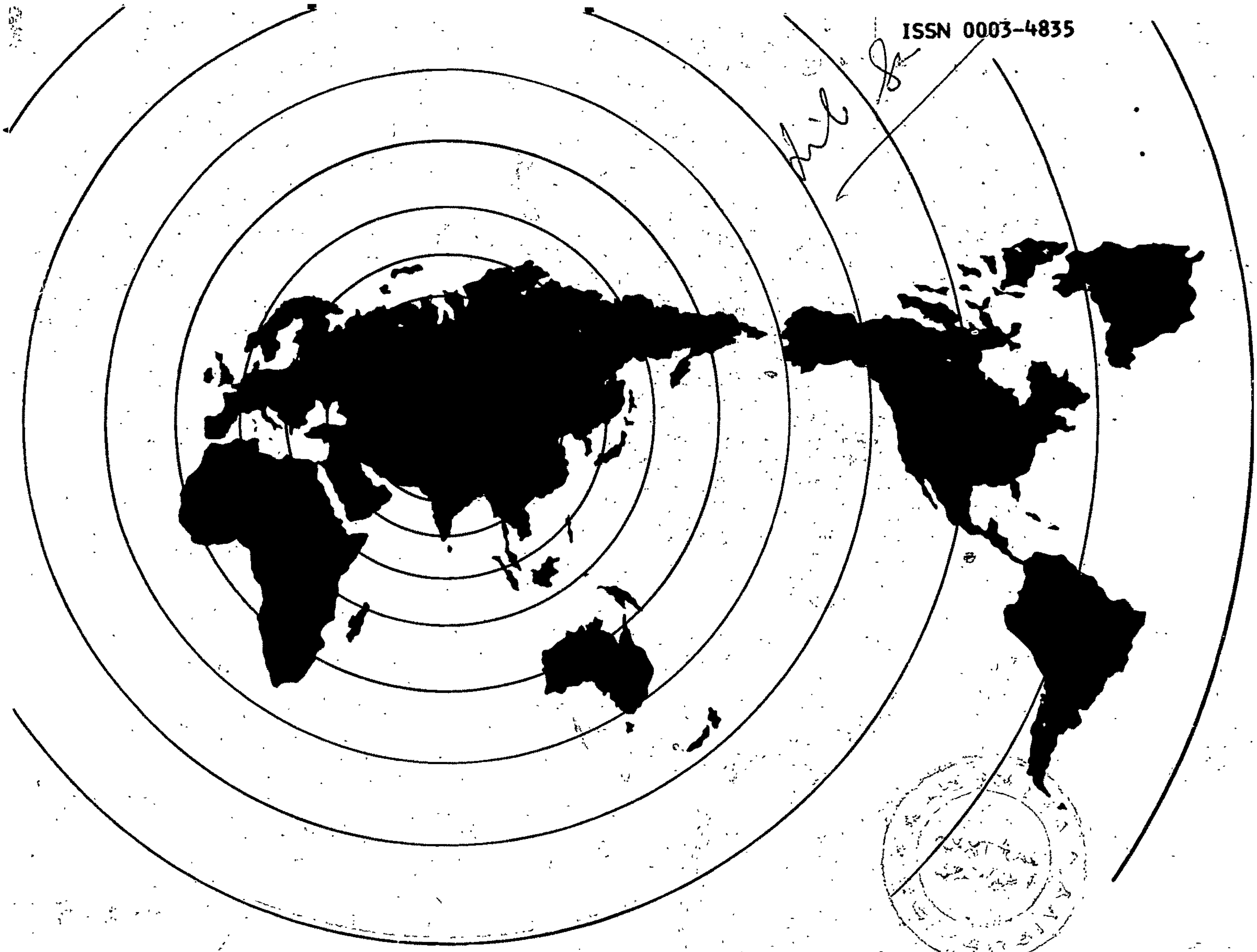

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ELECTRONIC TRANSFER OF DOCUMENTS

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INTRODUCTION

Indian National Scientific Documentation Centre (INSDOC) supplies documents to the research workers on request. The customers want to get the documents immediately after placing order for them. After the advent of Scientific and Industrial Research Network (SIRNET) and the subsequent facility of electronic mail for the research workers in a number of organisations, some of the customers started placing the documents supply orders through electronic mail with the expectation of getting it within a short time. Therefore, INSDOC started introducing information technology for automating its services and exploring the possibility of transferring the documents through a network to the customers.

INSDOC acquired Hewlett-Packard (HP) scanners for the desk-top publishing (DTP) system to scan maps or graphs in texts. The scanner produces a digitized image of the textual or graphic matter. It was used for optical character recognition (OCR) in massive data input required in creation of databases. Though a sufficiently reliable OCR system is not yet developed, experiments are being made to transfer the scanned images of textual pages from one PC to another via a telephone line.

DOCUMENT TRANSFER OPTIONS

To find a proper mechanism, following options were tried :

- Through a direct link
- Through the fax cards
- Through modems via telephone line

Fax Machine

Though fax machines and electronic mail are successfully used for transferring some of the documents, they are not suitable for transferring the kinds of documents requested by the customers.

The document supply through fax machines is not advantageous due to the following reasons :

a) The quality of reproduction at the receiver end is poor,
b) The thermal paper used in the fax machine is 20 times costlier than the ordinary paper,
c) The contents on fax paper do not stay for long. They evaporate in a few months,
d) The photocopy of fax paper for storage is very poor,
e) The transmission through fax machine is costly as it is transmitted on a direct STD line.

Electronic Mail

The transmission of documents through electronic mail is also not possible due to the following reasons :

a) The costly and time consuming task of keying in the documents to be E-mailed.
b) The inability to transfer the graphics in the documents.

The possibility of transferring the digitized scanned images of text and graphics by any of the three methods mentioned above was explored. The imaged data could not be transferred directly through a cable from one PC to another and hence the first option was abandoned.

The second option was tried by inserting fax cards in two PCs and connecting them via a telephone line. The scanned image of the documents was passed through the fax card in one PC, transmitted through the telephone line and was received on another PC but the print out of this image from a laser printer fitted at the reception end was found to be of a very poor quality. Several efforts were made to improve the quality of the print but the desired results could not be achieved. A study of the problem revealed that the fax cards transmit data only at a resolution of 75 dots per inch (dpi) which is the lowest possible resolution and cannot give a good sample reproduction (Fig. 1). Consequently, this option was also given up.

Finally, the transfer of the scanned image was attempted through electronic mail. After trying a number of options and variations in the software used in computer communication, the transmission was achieved to a considerable degree of satisfaction. Transfer of one page from one PC to another became technically feasible and it took about 15 minutes of transmission time. The final goal was now within a visible range. A number of experiments were carried out with different kinds of pages containing text and graphics including coloured graphics to test the technical feasibility of transferring the documents on telephone lines without keying in. It was found successful but required a very heavy reduction in transmission time to make it usable in the services of INSDOC.

TRANSMISSION TIME

The problem of reducing the transmission time was studied in two different ways : reduction in the size of the file and the increase in the rate of data transfer by using high speed modems. Both approaches had a number of inherent difficulties. The scanners and the associated software provide a facility of scanning the documents at different resolutions, viz. 300 dpi, 150 dpi, and 75 dpi. The higher the resolution, the better the reproduction and the bigger is the file size. For example, a simple A-4 size page when scanned on 300 dpi resolution produces a file of about 1 MB size. The same document scanned at 150 and 75 dpi produce a file of considerably smaller size (Table 1).

If the document consists of densely printed data or contains graphics, the file size in uncompressed format remains the same at corresponding resolutions. The same is true for coloured graphics (Table 2). The file size in uncompressed format is independent of the density of the text or graphics because the scanner produces a bit map of the page at a given resolution.

DATA COMPRESSION

The scanning softwares generally have an inbuilt data compression facility to reduce the disk storage space for the imaged data. Whenever a page is scanned and is stored on the disk, the image data is compressed in a ratio of 4:1. Thus, a file of 1 MB size is compressed to about 250 K. If it is transmitted through a modem of 1200 bauds per second (bps), the time taken is about four minutes. The transmission time is larger in the case of pages containing densely printed data and graphics or coloured graphics. The compressed file size is dependent on the density of text or graphics or coloured graphics in the original page scanned at a given resolution. The file size varies in each case (Table 3). Therefore, it is necessary to compress the data more heavily to reduce the transmission time.

There are also some limitations in using the modems of higher speeds. Different telephone lines are required to support modems with different speeds. The modems of 1200 and 2400 bps are supported by almost all the telephone lines. However, the modems of 9600 bps do not transmit data on every telephone line. Therefore, to achieve a reasonable transmission time the only viable option available is to compress the image data heavily.

Considerable effort was made in this direction by developing a better data compression software. Finally, compression in the ratio of 20:1 was achieved with the help of a software firm. It is easy to reduce the file size of a scanned page if it is scanned at a resolution of 75 or 150 dpi instead of 300 dpi (Table 4). But, the quality of reproduction is severely deteriorated. Amendments in the software were made to the effect that a page may be scanned at 75 dpi to reduce the file size and print it at 300 dpi resolution to get a better copy. However, the results were not satisfactory.

The efforts were directed to reduce the transmission time to a minimum possible. These experiments were limited to the transmission of a single page.

When a full document consisting of several pages was scanned and transmitted over the telephone line, the system took slightly more time in the tra-

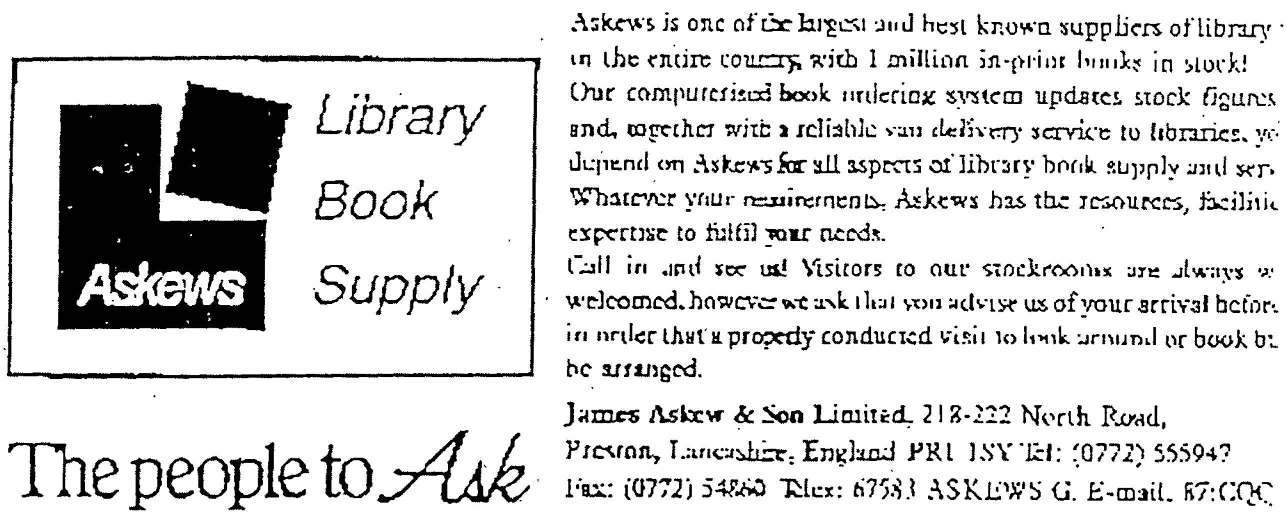
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Fig. 1 A Sample of text scanned at 75dpi

Table 1.

A Page Scanned at Different Resolutions (Uncompressed Size)

Resolution	File Size (in bytes)
75 dpi	68748
150 dpi	272212
300 dpi	1087512

Table 2.

Uncompressed Size of a Page Containing Graphics (Black & White and Colour) Scanned at Different Resolutions (Uncompressed Size)

Resolution (Bytes)	B&W Graphics (Bytes)	Colour Graphics
75 dpi	68748	68748
150 dpi	272212	272212
300 dpi	1087512	1087512

Table 3.

File Size Using Different Resolutions and Different Types of Documents

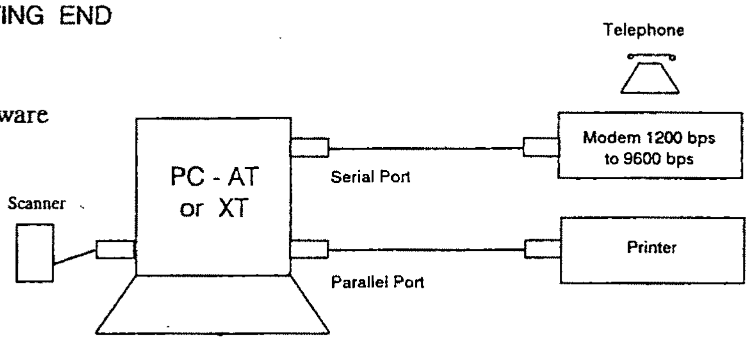
Resolution (Bytes)	Text	B/W Graphics (Bytes)	Colour Graphics
75 dpi	1.45	1.55	1.64
150 dpi	2.89	3.36	3.66
300 dpi	8.91	9.88	11.56

nsmission of first page due to setting up of various protocols (handshake time) but the transmission time for subsequent pages was reduced (Table 5). However, the continuous transmission of several pages could be done only after making some changes in the software which earlier was storing each page as a separate file. The total time taken in the transmission of a full document consisting of two or three pages was reduced as compared to the total time taken in each page separately (Table 5).

From the experiments it was concluded that the best results are obtained when a document con-

TRANSMITTING END

Hardware



Software

Scanning & Data Compression Software
Communication Software

RECEIVING END - similar to that at the transmitting end set up

Fig. 2 Schematic Representation of Document Transfer

Table 4.

Compressed File Size of a Page Scanned at Different Resolutions

dpi	File Size
300	183.7 K
150	71.6 K
75	34.0 K

Table 5.

Transmission Time of Documents of One or More Pages Scanned at 150 dpi

Pages	Transfer Time
1	1 min. 45 sec.
2	2 min. 32 sec.
3	4 min. 45 sec.
4	6 min. 40 sec.
5	6 min. 40 sec.
6	9 min. 5 sec.

sisting of more than two pages is scanned at 150 dpi and transmitted at a modem speed of 9600 bps. As the Department of Telecommunications is already setting up data network lines, the modem speed of 9600 bps or even more will be easily supported.

HARDWARE AND SOFTWARE REQUIREMENT

The present study used following set of equipment at both transmitting and receiving for transmission of documents from both sides.

1. Scanner
2. PC-XT/AT
3. Modem 9600 bps
4. Telephone line
5. Laser printer
6. Scanning and data compression software
7. Communication software

However, the receiving or the transmission end need not have the scanner or the printer respectively if it is not transmitting or receiving the documents respectively (Figure 2).

CONCLUSION

If a document is scanned at 300 dpi resolution and printed at the same resolution the quality of the documents is almost similar to the original.

The mechanism described above for transferring the documents on telephone lines with the help of computers can revolutionize the document supply system. It provides the documents on plain paper with a good quality print, unlike fax machines which use costly thermal paper and the print out is generally quite poor. It is considerably cheaper as compared to fax transmission because the documents can be transmitted on networking systems which do not use a direct STD line like a fax machine. The networks are a cooperative venture of their members and transmit the data on short distant lines from one system to another so as to reach its final destination. Though it takes some what longer time as compared to long distance STD link but it is quite cheap and in the case of large volume of data to be transmitted the total cost difference may be a large amount. The network transmission is expected to be considerably cheaper in the near future as and when the Department of Telecommunications makes high speed leased lines available to users.

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·COLLABORATIVE RESEARCH TRENDS IN EXPLORATION GEOPHYSICS

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A comprehensive database, the cumulative Index of Geophysics for the period 1936-1985 was analysed to study collaborative and authorship trends in exploration geophysics. A total of 3,417 publications in GEOPHYSICS and 1,318 publications in GEOPHYSICAL PROSPECTING comprised the database. About 56.2% of all the publications were found to be single authored items. The number of single authored items has been gradually declining from 1936 to 1985. Authorship per item for the period was found to be 1.6 which has increased from 1.17 per item during 1936-1950 to 1.9 per item during 1981-1985. The results of this study reveal that like in any other discipline in sciences, collaboration in Exploration Geophysics research has been increasing over the period of time.

INTRODUCTION

Since scientific research is becoming an increasingly collaborative endeavour, the modern scientists seldom carry out their research alone. Price (8) noted that "the proportion of multiple-authored papers has been increasing steadily since the beginning of 20th century and if the same trend continued, there would hardly be any single-authored paper by 1980". However, this did not happen as fast as Price predicted although the extent of collaboration, especially in sciences, has been steadily increasing. Clarke (4) challenged the view of Price and produced data on collaborative trend in biomedical sciences for the period between 1934 and 1969 and proved that the average number of authors per paper had remained almost stable at about 2.3 during this period. Gupta (5) also found a similar trend in entomological research in Nigeria but that reflected the pattern of research in a developing country. Trends of collaborative research are well reflected in the patterns of scientific publications with more and more research papers by several authors rather than by only one. Several studies have been reported on such patterns and it is found that patterns, nature and magnitude of collaboration differ with discipline, culture and time (1-5,7,8). Gupta (5) in a review paper highlights some of the important findings of collaborative studies previously reported in the literature and attempts to establish the fact that personal attitudes, complexity of problems to be solved, management structures (funds and facilities of expertise and experimentation etc.) and other demographic and environmental factors influence the research and research patterns. But an investigation on collaborative patterns in any subject area or speciality for a specific period of time, is likely to reflect the nature, dynamism and other characteristics of the discipline. Findings of such studies can usefully be employed in research planning and organising information resources and services more effectively and efficiently. This facilitates and accelerates research activities in that discipline.

EXPLORATION GEOPHYSICS

Exploration geophysics, also known as applied geophysics, a sub-discipline of geophysics is concerned with studies of structures and layers of the earth which are sufficiently shallow to be exploited by man. Exploration geophysics is still a very young discipline compared to many other disciplines in geosciences. Methods of geophysical exploration started around 1923 for mineral exploration and they have since become increasingly important especially because of their increasing and useful application in oil exploration. During early years, development of the subject mostly depended on the exploration activities of mineral industries and of the petroleum industry in particular. But recently, developments in physics, electronics and other disciplines in science directly influenced the development of exploration geophysics. Advancement of modern technology in fields like computer science, satellite communication, aviation, shipping and transport etc. has accelerated and facilitated exploration activities. development and construction of geophysical instruments for data collection and processing was also largely influenced by the developments in the fields like electronics, mechanical engineering and graphic technology etc. Techniques of data recording, processing and interpretation have remarkably improved with increased and improved application of information technology especially the computer technology and computer graphics. Recent offshore ventures and frequent successes of geophysical methods to discover more petroleum reserves further boosted the progress of exploration geophysics and its research activities. The details of exploration geophysics, its research and information activities have been described in another paper by Gupta (6).

OBJECTIVES

The main objectives of this study was to investigate the collaborative trends in the research of exploration geophysics. It is presumed that the research collaboration in this newly developing discipline should also follow the trends of other disciplines in science and also that collaboration should be increasing steadily with time.

THE DATABASE

The necessary data for this study were obtained from the Cumulative Index of Geophysics for the period, 1936-1985 published by the Society of the Exploration Geophysicists (=SEG) (11). The index provides complete bibliographic details of research publications that appeared in two most important journals of the discipline :

1) GEOPHYSICS is published by the Society of the Exploration Geophysicists from USA (published from 1936 and indexed for the period, 1936-1985) and
2) GEOPHYSICAL PROSPECTING is published by the European Society of the Exploration Geophysicists from Europe (published from 1953 and indexed for the period, 1953-1985). The index of these two journals not only provided sufficient and adequate material for this data but also provided the most comprehensive and representative sample for the research output in exploration geophysics which was quite suitable for the purpose of this study.

METHODOLOGY

Authorship is an observable phenomenon reflecting the contemporary practices by clearly showing patterns of communication, productivity, collaboration and influences among researches even though their quantities and qualities are not understood. Thus the knowledge of this relationship is useful in the study of communication among scholars. It also helps in assessing their strength in scientific productivity and in determining research patterns of a subject or a speciality. Data on authorship were collected item by item for each journal excluding the items produced by corporate authors. Data on the year of publication, number of author (s) for each item were recorded; frequencies for each year and class of authorship for each journal were counted. Authorship data for each journal were computed for each five-year period. Data for frequencies, year to year and five-year periods are plotted and illustrated in figure 1 for single-authored items while similar data for multiple authored items are plotted in figure 2. Authorship trend is presented graphically in figure 3. Authorship and average authorship per item for each five-year period were computed and presented in Table 3.

RESULTS AND DISCUSSIONS

Authorship data for each five-year period for GEOPHYSICS are given in Table 1.A total of 3,417 items were published in *GEOPHYSICS* during the period between 1936 and 1985. Out of these items, 2,015 (about 59% of all the items) appeared as single authored items; 935 as two authored items; 337 as three authored items; 85 as four authored items; 30 as five authored items and only 15 items were contributed by more than five authors jointly. Similarly, authorship data for GEOPHYSICAL PROSPECTING are given in Table 2. Almost an identical trend can be observed from the analysis of these data. A total of 1,318 items were published in *Geophysical Prospecting* during the period 1953-1985. of these items, 741 (or to say about 56% of all the items) were published as single authored items; 420 as two authored items; 120 as three authored items; 27 as

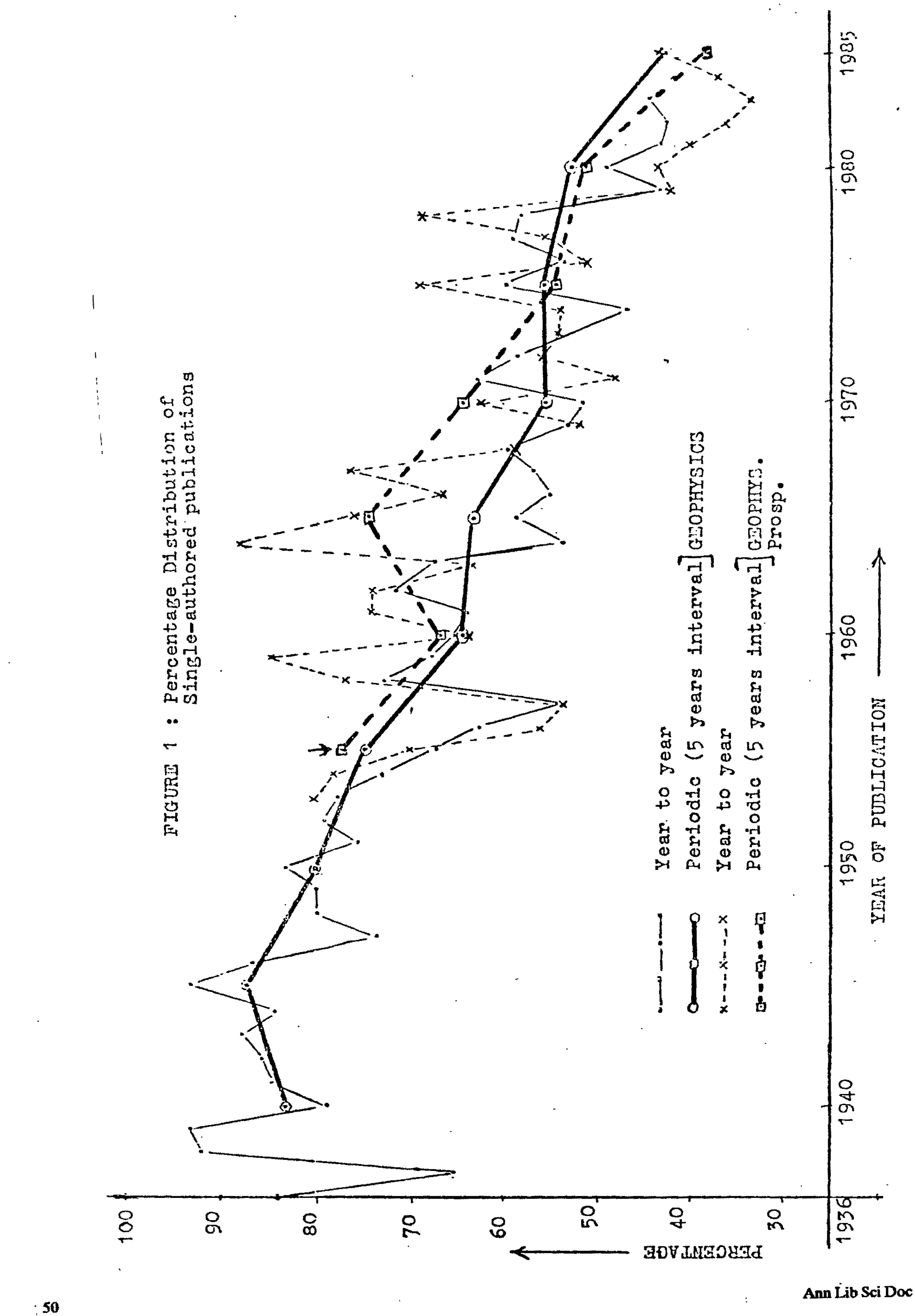

FIGURE 1 : Percentage Distribution of Single-authored publications

Table 1

Distribution of Publications according to Collaboration of authors: GEOPHYSICS; 1936-1985

Period	Total items	Number of Publications and percentage by:											
		one author		two authors		three authors		four authors		five authors		*	*
		No.	%	No.	%	No.	%	No.	%	No.	%	No	%
1936-40	141	117	83.0	21	14.9	2	1.4	0	0.0	0	0.0	0	0.0
1941-45	153	133	87.0	17	11.1	3	2.0	0	0.0	0	0.0	0	0.0
1946-50	181	146	80.0	29	16.0	5	2.8	0	0.0	1	0.5	0	0.0
1951-55	248	186	75.0	44	17.7	11	4.4	5	2.0	2	0.8	0	0.0
1956-60	274	177	64.6	69	25.2	26	9.5	1	0.3	0	0.0	1	0.3
1961-65	372	235	63.1	81	21.8	36	9.7	6	1.6	2	0.5	2	0.5
1966-70	362	200	55.3	107	29.6	43	11.9	8	2.2	3	0.8	1	0.3
1971-75	371	206	55.5	113	30.5	33	8.9	11	3.0	7	1.9	1	0.3
1976-80	505	267	52.9	158	31.3	56	11.0	16	3.2	6	1.2		
1981-85	821	348	42.4	296	36.1	122	14.9	38	4.6	9	1.1	7	0.9
Total and Average%	3417	2015	59.0	935	27.4	337	9.9	85	2.5	30	0.9	15	0.4

* * *Items and percentage by more than five authors*

Table 2

Distribution of Publications according to Collaboration of authors: GEOPHYSICAL PROSPECTING; 1953 -1985

Period	Total items	Number of Publications and percentage by:											
		one author		two authors		three authors		four authors		five authors		*	*
		No.	%	No.	%	No.	%	No.	%	No.	%	No	%
1953-55	70	53	75.7	16	22.9	1	1.4	0	0.0	0	0.0		
1956-60	139	93	66.9	36	25.9	9	6.5	1	0.7	0	0.0		
1961-65	150	112	74.7	31	20.7	7	4.7	0	0.0	0	0.0		
1966-70	173	111	64.2	51	29.5	9	5.2	1	0.6	1	0.6		
1971-75	244	132	54.1	87	35.7	16	6.6	7	2.9	2	0.8		
1976-80	258	132	51.2	89	34.5	29	11.2	7	2.7	1	0.4		
1981-85	284	108	38.0	110	38.7	49	17.3	11	3.9	5	1.8		
Total and average %	1318	741	56.2	420	31.9	120	9.1	27	2.1	9	1.1		

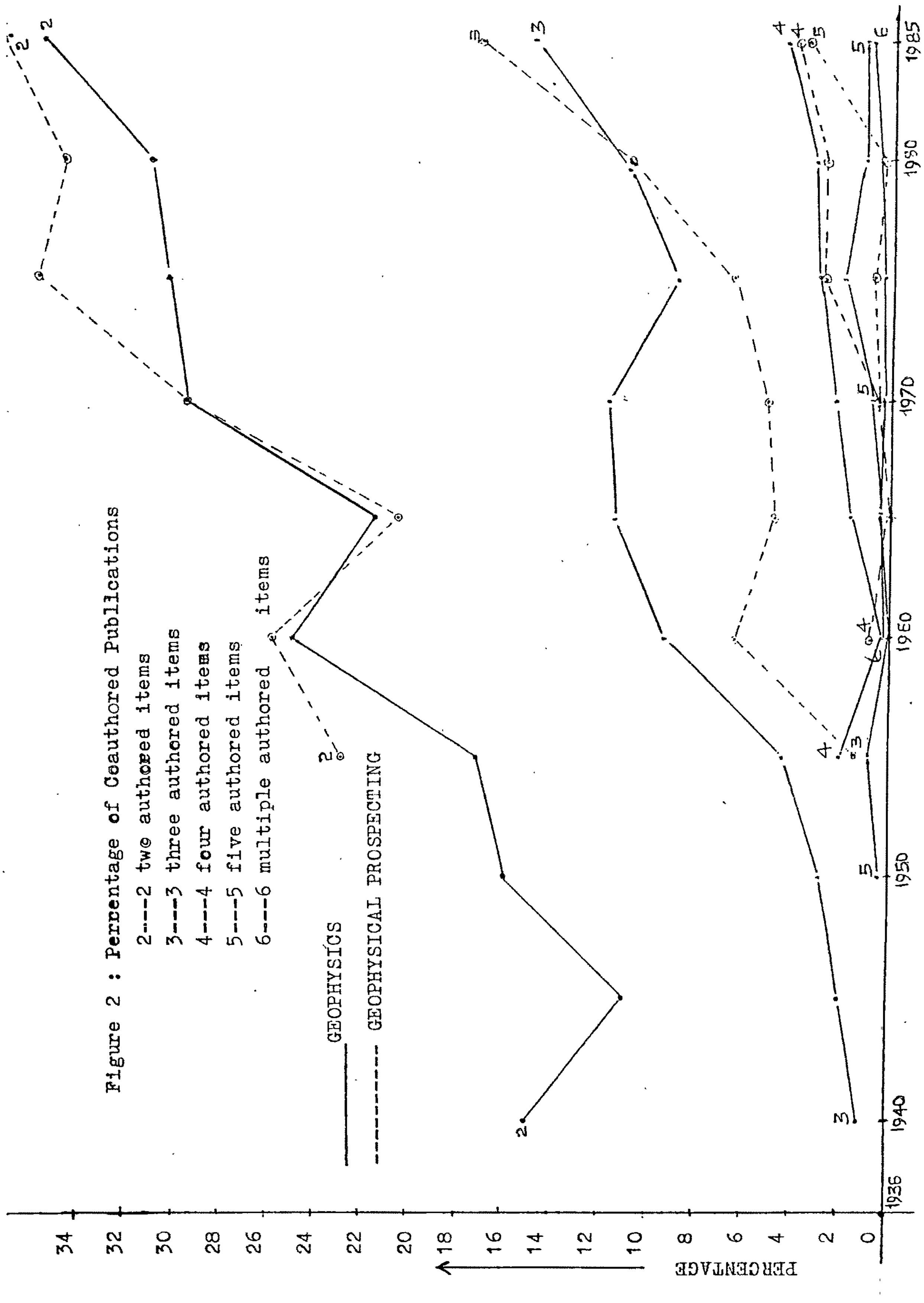

Figure 2 : Percentage of Coauthored Publications

four authored items; 9 as five authored items and only 1 item was contributed by more than five authors jointly. Percentage distribution of single authored publications is shown in figure 1.

General trend for the two journals appears to be the same with decreasing trend for single authored items from 1936 to 1985. Single authored items decreased from 87% during 1941-1945 to 42.4% during 1981-1985 (the average being 59.0% for the whole period in case of GEOPHYSICS). Single authored publications in case of GEOPHYSICAL PROSPECTING, decreased from 75.7% during 1953-1955 to 38.0% during 1981-1985 (average being 56.2% for the whole period). Authorship data given in table 3 indicate that the field of exploration geophysics has been developing steadily over the years with increasing research activities. The number of items published from year to year has been increasing (from 141 publications during 1936-1940 to 821 items during 1981-1985 in case of GEOPHYSICS and similarly, from 139 during 1956-1960 to 284 during 1981-1985 in case of *Geophysical Prospecting)*. The authorship which was 1.17 per item during the period 1936-1945 increased to 1.88 per item during the period 1981-1985 for GEOPHYSICS and in case of GEOPHYSICAL Prospecting, the authorship from 1.14 per item during the period 1953-1960 jumped to 1.92 during the period 1981-1985. The average for the whole period and for both the journals comes to 1.6 per item. This goes contrary to the findings of Clarke (4) and also establishes the fact that the field of medical sciences is fairly established while the exploration geophysics is still in developing stage.

CONCLUSIONS

A few general and broad conclusions can be drawn from the findings of this study :

1) There is a perceptible increase in the collaborative research in the field of Exploration Geophysics from 1936 to 1985.
2) The reduction in single authored papers during the period 1981-1985 is very sharp which reflects the influence of development in other scientific disciplines and approach to interdisciplinary research collaborative effort.
3) Authorship per item has been increasing steadily from an average of 1.2 per item

Table 3

Authorship Trend : Exploration Geophysics, 1936-1985 GEOPHYSICS

Period	GEOPHYSICAL			PROSPECTING		
	Number of items	Authorship	Authorship per item	Number of items	Authorship	Authorship per item
1936-40	141	165	1.17	...	...	...
1941-45	153	176	1.15	...	...	...
1946-50	181	224	1.23	...	...	...
1951-55	248	337	1.35	70 &	88	1.14
1956-60	274	403	1.47	139	196	1.41
1961-65	372	551	1.48	150	196	1.30
1966-70	362	596	1.65	173	249	1.44
1971-75	371	616	1.66	244	392	1.61
1976-80	505	863	1.71	258	430	1.67
1981-85	821	1545	1.88	284	545	1.92
Total	3417	5476	1.60 &&	1318	2100	1.59&&

& Data only for the period 1953-1955
&& Average authorship per item for the whole period, 1936-1985

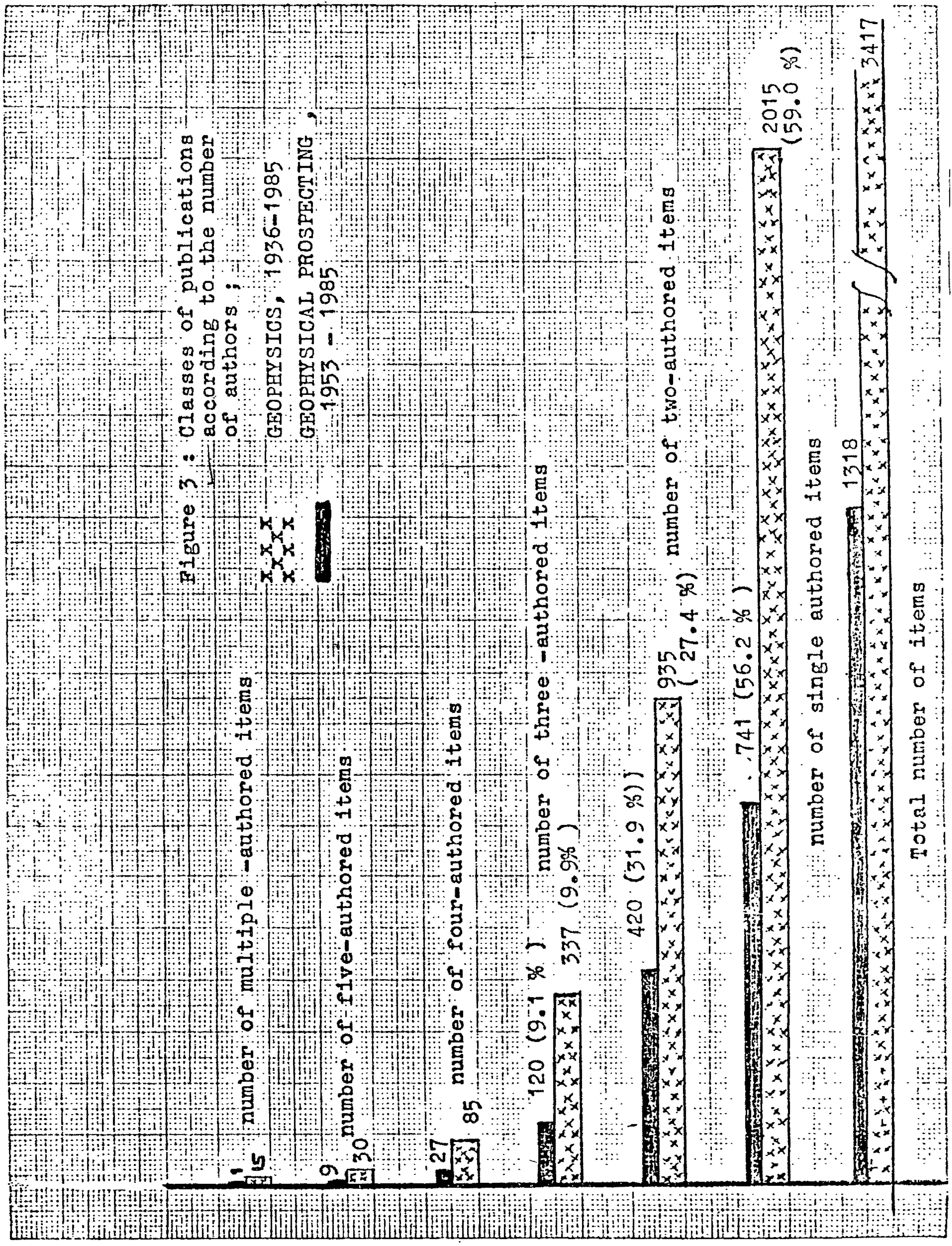

Figure 3 : Classes of publications according to the number of authors ;

during 1936-1950 to 1.9 per item during 1981-1985 which is not constant and certainly lower than medical sciences as reported by Clarke(4) (average being 1.6 for the whole period in comparison to 2.3 items in case of medical sciences). There is a sudden increase in authorship trend from 1.6 to 1.9 per item during the period 1981-1985 confirming the influence of other disciplines as stated above in para 2.

4) The collaborative and authorship trends as found in this study, suggest that Exploration Geophysics is still at a developing stage and there is a strong possibility that the trend will continue towards further increase in future.
5) Therefore, it is recommended that further studies should be conducted to observe the dynamic phenomenon of growth and development in the research activities of this young field of exploration geophysics.

REFERENCES

1) Beaver, D. de B and Rosen, R.: Studies in scientific collaboration. Pt.I. The professional origins of scientific coauthorships. Scientometrics. 1978 1(1), 65-84.

2) ------- : Pt. II. Scientific coauthorship, research productivity and visibility in the French scientific elite. Scientometrics. 1979 1(2),133-145.

3) ------- : Pt. III. Professionalisation and the natural history of modern scientific coauthorship. Scientometrics. 1979 1(2), 231-245.

4) Clarke, Beverly L.: Multiple authorship trends in scientific papers., Science. 1964, 143(3608), 822-824.

5) Gupta, D.K. : Collaboration in research output: A review and case study of collaborative trends of entomological research in Nigeria, 1900-1973. International Information Communication and Education 1986, 5(1), 57-75.

6) --------. Development of exploration geophysics and its information activities. Annals of Library Science and documentation. 1986, 33(3), 117-125.

7) Pao, M.L. : Collaboration in computational musicology. Journal of the American Society for Information Science 1982, 33, 38-43.

8) Price, D.J. de Solla and Beaver, de B. Donald. : Collaboration in an invisible college. American Psychologist. 1966, 21, 1011-1018.

9) Subramanyam K. : Bibliometric studies of research collaboration: A review. Journal of Information Science. 1983, 6, 33-38.

10) Zuckerman, Harriet A.: Nobel laureates in science: Patterns of productivity, collaboration and authorship. American Sociological Review. 1967, 32, 391-403.

11) Zwart, William J. : ed. Cumulative iiindex of geophysics, 1936-1985. Geophysics. 51, 1986, Supp, Tulsa, Society of Exploration Geophysicists, 8th computerised edition.

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NEED FOR TECHNICAL TRANSLATION SERVICE FOR THE MANUFACTURING SECTOR IN ETHIOPIA

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The paper discusses technical translation activities in the public manufacturing sector based on a questionnaire survey conducted with 40 representative enterprises drawn from seven industry groups in Ethiopia. Recommendations are also forwarded to establish technical translation service at national level.

INTRODUCTION

Most of the developing nations depend on import of foreign technology in their industrialization endeavors. The interdependence among nations as caused by the transfer of technology makes the translation of the source language inevitable. Today, translation activities have become an integrated part of the technology transfer. The world's translation expenditures including research projects in computational linguistics and speech technology was estimated at 150 million dollars in 1991 (Rolling 1991). The actual translation volume was estimated to reach 450 million pages in the same year. The majority of this was in the fields of technology and trade. It is the developed world that is leading in the translation activities. Among developing countries, nations like India, where technical collaboration programmes are coming up fast, are developing this activity rapidly.

The industrial sector in Ethiopia has generally been dependent on technology imports. Almost all machinery for the public manufacturing enterprises were largely in the hands of foreign private entrepreneurs. As these machines originated from different nations specifications, operation and technical manuals are produced in the languages of technology-exporting countries and the documentation could be transferred to Ethiopia in their original languages because the core technical staff of the factories were foreigners.

In this light, this paper discusses problems encountered by enterprises in using technical documents procured in foreign languages other than English and examines the need for a national technical translation service.

METHODOLOGY

With an overall objective of identifying the information needs of the public manufacturing enterprises in Ethiopia, a questionnaire survey was conducted on 40 public enterprises (Bekele, 1992). The representative samples were drawn from seven states corporations that manage the food, textile, leather and leather products, beverage, metal works, chemical and printing manufacturing establishments located in and around Addis Ababa (the capital city of Ethiopia). The Ministry of Industry is responsible for the overall management and coordination of activities of the public enterprises and the corporations.

In manufacturing enterprises, technical documents are usually maintained and heavily used by technical and production staff of the enterprises. The use of such documents by the other departments like marketing, finance, and administration personnel in an enterprise is generally assumed to be very minimal. With this assumption, the survey on translation was restricted to respondents from technical and production units. Accordingly, a total of 64 individuals from technical and production units of 34 enterprises responded to the particular questions related to translation.

RESULTS & DISCUSSION

In response to the question on whether they have encountered non-English foreign technical documents, out of the total 64 respondents from technical and production units, 78% (50) indicated they receive such documents, while 22% (14) did not. Computation of percentages of respondents who encountered technical documents in foreign language other than English per industry group results: 100% for metal works and leather industries, 91.7% for beverages, 71.4% for paper and printing units, 63.6% for the food, 60% for the textile and 57% for chemical enterprises.

The most important languages in which technical documents were acquired were German, Italian and French in the descending order. Each of the above language were reported by more than 50% of the respondents and across all sample industry groups. Other languages of modest significance are Dutch, Czech, Korean, Arabic, Finnish and Spanish.

It is obvious that when any person comes across some important document, he has to be literate in the language of the document or must find some one who can translate for him and if he fails to find a means of translating it, he has to procure its translated version if there is any or discard the document altogether. With this in view, respondents were asked how they handled the documents. This question helps us to know the presence of multilingual staff in enterprises, current translation activities and the extent of the problem of technical translation.

The percentages in the Table 1 were computed for the 50 respondents who came across non-English foreign technical documents. It totals more than 100 because respondents used more than one means of translating the documents.

Even though there are no organized technical translation services in the country, it can be observed from the table that there are potential translators who already offered their help for immediate purposes. Other sources of translation include foreign embassies, commercial attaches, suppliers of the machines and foreign universities. The major serious problem identified by the survey was that 36% (18) of the respondents could not make use of these documentation because of language barriers. Among the respondents some tried to make use of the documents by carefully observing the various technical drawings though they could not read the text.

As discussed above, technical documents are very vital for the healthy operation of the enterprises and every possible means was explored to make use of these.

CONCLUSION

Effective transfer of technology involves transfer of information. International transfer of technology has made translation of technical documents from originating source language into English or the language of the user country a necessity.

Public manufacturing enterprises in Ethiopia, which heavily depend on foreign industrial technology, were forced to use very important technical manuals written in foreign languages they are

Table 1:
Action taken by users of non-English foreign technical documents.

Sl. No.	Action taken	Respondents
1.	User himself is a literate in the respective foreign language (s)	5 (10%)
2.	Translated by staff in the firm	10 (20%)
3.	Translated by friends outside the firm in the country	19 (38%)
4.	Translated by other sources	15 (30%)
5.	Could not use it at all	18 (36%)

not familiar with. Because of the absence of any organized technical translation service in the country, enterprises had to spend significant amount of resource and time to make the documents usable.

As the Ministry of Industry is responsible for the overall management and control of public enterprises, it should establish a Technical Translating Service under its Documentation and Information Unit with the aims of:

- collecting, translating into local languages and disseminating important technical documents published in foreign languages other than English;
- developing technical translation capability into local languages; and
- rendering technical translation service to industrial users on request.

The Ministry may get the assistance of the Addis Ababa University, Ethiopian Language Academy and the Pan-African Development Information System (PADIS) during the planning and implementation phases.

REFERENCES

1. Bekele Negeri : Information needs of the public manufacturing enterprises in Ethiopia. MSc Thesis. Addis Ababa : Addis Ababa University, 1992.

2. Gizachew Shiferaw : The choice and development of manufacturing technology in Ethiopia. : In Proceedings of the First National Symposium on industrial development, Nov. 1988, Addis Ababa : Ministry of Industry.

3. Neelameghan A : Information needs and information sources of small enterprises : A synoptic view. Library Science with a Slant to Documentation 14 (3&4), 136-139.

4. Rolling Loll : The role of the European community multilingual aspect. Presented to the Inter-regional Euro-Arab technical seminar on information systems and networks held at Luxembourg 25-29 Nov. 1991.

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UTILITY OF PERIODICALS IN THE ANDHRA UNIVERSITY LIBRARY : A CASE STUDY

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Studies the use made of periodicals by the Faculty of Andhra University Library. Survey research method has been used to study users. The study covers users who visited the library during February to March 1989. Analysis of data is presented in the form of tables. Suggests methods to enhance use of periodicals.

INTRODUCTION

Periodicals are an important source of information, especially, to those engaged in research and development activities in the various universities. Hence, generally, major share of the university library budget is allocated towards the subscription of periodicals. In the present study attempts has been made to study the use of periodicals in a university library.

THE STUDY

Dr. V.S. Krishna Memorial library which has nearly 4,00,000 books, 1,400 periodicals and a special collection of Sanskrit manuscripts, is no exception to the rule.

This university library caters to the information needs of 2,000 research scholars and 1,600 faculty members. Nearly, 1,500 readers visit the library daily. Table 1 shows the number of periodicals and the expenditure incurred on them during the year 1987-89. It may be observed that while expenditure on books is the same, the expenditure on periodicals has increased over the years. However, the number of periodicals subscribed has decreased from 1,400 to 1,385.

Due to increase in subscription costs and with no additional budgetary allocation, pruning of the periodicals list becomes a necessity. Therefore, cancellation of subscription to some periodicals is resorted to in the universities. However, discontinuing subscription of periodicals is a very difficult job as faculty members are not in favour of deleting any periodical belonging to their respective disciplines. This difficulty is compounded by the fact that there is no standardized method for pruning of periodicals. The practice of pruning of periodicals differs from library to library.

Therefore, it was felt that a survey on the use made of periodicals by the faculty and students would help in the identification of frequently used periodicals and less frequently used periodicals. This, in its turn, would facilitate decision regarding continuance or otherwise of individual periodicals.

METHODOLOGY

The present study covers the users who visited the periodical section during the period February to March 1989. They were requested to write their name, department, status (Teacher/Research Scholar/Student) and the title of the periodical they had referred in the ledger books provided. The survey was spread over two months on all working days of the library. It was observed that about 1,500 readers visited the library daily during that period. In addition, the loose issues of periodicals borrowed for home reading during the survey period were also considered.

ANALYSIS OF DATA

Users

Table 2 gives a picture of number of persons consulting periodicals in the periodical section during the survey period. Five thousand eight hundred and fifty one persons have consulted periodicals in the periodicals section during the survey period. Further, it may be observed that

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** Paper presented at the workshop on Library and Management held at DRTC, Bangalore.

Table 1

University Library Budget for Periodicals and Books

Year	No. of Periodicals including Magazines	Expenditure on Periodical Subscription from the Univ. Lib. budget	Expenditure on purchase of books from the Lib. budget
1987	1400	Rs. 32,16,200.00	Rs. 1,68,000.00
1988	1360	Rs. 37,16,200.00	Rs. 1,71,000.00
1989	1345	Rs. 46,54,200.00	Rs. 1,73,000.00

Table 2

Number of Users Consulting the Periodicals During the Survey Period.

Sl.No.	Users	February'89	March'89	Total Number of Members
1.	Teachers	134	99	233
2.	Research Scholars	599	542	1,141
3.	Students	2,189	2,288	4,477
	Total	2,922	2,929	5,851

Table 3

Percentage of Users in the Different Categories who consulted the Periodical Section During the Survey Period.

Sl. No.	Users	Approximate total number of registered borrowers	Total number of users consulted the section	Percentage out of total number of registered borrowers (%)	Percentage out of total number of users consulted the section (%)
1.	Teachers	1,600	233	14.56	3.98
2.	Research Scholars	2,000	1,141	57.05	19.50
3.	Students	6,000	4,477	74.61	76.52

76% of the users consulting periodicals were students, 20% were research scholars and only 4% were faculty members.

On the other hand, Table 3, shows the percentage of users in the different categories who consulted the periodical section during the survey period. The figures reveal the poor use made of periodicals by the persons (Faculty and research scholars) for whom it was procured. Further, it may also be observed that a meagre 15% of the total number of teachers consulted periodicals. This is a rather sad state of affairs. The figures for research scholars are much better with 57% using the periodicals. It is heartening to note that the best use of periodicals is by the students.

Periodicals Consulted

The library subscribed 1,345 periodicals covering Science and Technology, Arts, Humanities as well as periodicals of general nature like, Time, Newsweek etc., in the year 1989. Out of the total consultations of the periodicals in the periodical section during the month of February 1989 (Table 4), the consultation of periodicals of gen-

Table 4

Number of Consultations of Periodicals During the Period of February 1989

Sl.No.	Periodicals	Consulted by Teachers	Consulted by Research Scholars	Consulted by Students	Number of consultations of periodicals	Percentage of consultations out of total consultations (%)
1.	Science and Technology	145	355	583	1083	29.20
2.	Arts and Humanities	78	259	474	811	21.87
3.	General Nature	11	474	1330	1815	48.93

Table 5

Number of Consultations of Periodicals During the Period of March 1989

Sl.No.	Periodicals	Consulted by Teachers	Consulted by Research Scholars	Consulted by Students	Number of consultations of periodicals	Percentage of consultations out of total consultations (%)
1.	Science and Technology	57	257	424	738	26.04
2.	Arts and Humanities	38	150	469	657	23.18
3.	General Nature	8	117	1314	1439	50.78

eral nature by the students was high followed by periodicals of Science and Technology, Arts and Humanities. A similar pattern is observed in relation to research scholars. However, in relation to teachers, the pattern is different with Science and Technology occupying the first position, followed by other subjects.

Table 5, provides the number of consultations of periodicals during the period of March 1989. A similar pattern (as observed in February 1989) is observed in relation to the consultation of periodicals by the three groups of users.

Periodicals Borowed vis-a-vis Users

Table 6, gives the percentage of users in the different categories who borrowed the periodicals during the survey period. It may be observed that 9.06 percent of the total number of teachers borrowed periodicals. This is not impressive in the utility of periodicals for their research work. The figures for research scholars are somewhat better with 12.02 percent borrowing the periodicals. It is surprising to note that a meagre, 4.28 percent of the total number of students borrowed periodicals.

Periodicals Borrowed Subject-wise

Table 7 shows the number of periodicals borrowed for home reading during the survey period. Out of the total periodicals subscribed by the library, 55.83 percent were of science and technology (occupying the first position). followed by 30.41 percent of arts and humanities and 13.76

Table 6

Percentage of Users in the Different Categories who Borrowed Periodicals During the Survey Period

Sl.No.	Users	Approximate total number of registered borrowers	Total number of users who borrowed periodicals	Percentage Out of Total number of registered periodicals	Percentage out of total number of users who borrowed periodicals
1	Teachers	1,600	145	9.06	22.45
2.	Research scholers	2,000	244	12.02	37.77
3.	Students	6,000	257	4.28	39.78

Table 7

Number of Periodicals Borrowed During the Survey Period

Sl. No.	Periodicals	Number of periodicals borrowed	Percentage (%)
1.	Science & Technology	426	55.83
2.	Arts & Humanities	232	30.41
3.	General Nature	105	13.76

percent of general nature. This indicates that the users belonging to the field of science and technology availed borrowing facilities better than the other groups.

REASONS FOR POOR UTILITY OF PERIODICALS

The teachers and research scholars, when contacted, gave the following reasons for poor utilisation of periodicals in the section:

i) Periodical section is not easily accessible as it is located on the fourth floor and there is no lift facility.
ii) Back numbers of periodicals required by the teachers, are being received through their research scholars or others by getting them issued for home reading.

SUGGESTIONS

On the basis of the above mantioned findings from the study, the following suggestions are being forwarded :

a) Periodical section should be located on the ground floor so as to make it convenient for the users. Alternatively, lift facility should be provided.
b) Current Awareness Services should be introduced so as to alert the users, especially faculty and research scholars, of documents/information published in their respective areas of specialisation.
c) A marketing approach should be adopted, so that the resources of the university library are better utilized by the teachers, research scholars and students. Basically speaking, marketing approach would consist of identification of the target user groups, determination of their needs, designing of services appropriate to their needs, choosing the right type of distribution channel and last but not the least, feedback and evaluation of services.

REFERENCES

1. Golden Jubilee Celebrations : Andhra University Souvenir. Waltair, Andhra University, 1978.
2. Buttler, Lois : Analysing the library periodical literature; content and authorship. College and Research Libraries 1991, 52 (1), 38-53.
3. Guha B : Documentation and Information Services. Calcutta, World Press, 1978.
4. Kaula P N: Periodicals in Libraries. Hearld of Library Science 1989, 28 (1-2), 69-.
5. Lakhanpal S K: Deselection of Serials. International Librarian 1985, 1, 27-39.
6. Shah P C: Procurement of Periodicals. IASLIC Bulletin 1976, 21, 14-20.

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LITERATURE CONTRIBUTION IN INDIAN JOURNAL OF GENETICS AND PLANT BREEDING: A CITATION ANALYSIS

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A total of 4136 citations that appeared in the articles of 5 volumes, 45-49 (1985-89) of Indian Journal of Genetics and Plant Breeding were collected and a rank list of 60 most cited primary journals representing 66.86% of the total citations was prepared. The study reveals that the literature of Genetics and Plant Breeding was scattered in 574 journals of which almost 505 citations were covered by only 20 journals. Among them the Indian Journal of Genetics and Plant Breeding topped the list with 12.35% citations followed by Crop Science (8.17%) and Indian Journal of Agricultural Science (3.50%). Countrywise distribution of first 60 ranked journals and the chronological distribution of all citations are given. It also provides the scenario of contribution of Indian and foreign theses and the authorship pattern revealing that multi-authored papers were more in practice.

INTRODUCTION

Indian Journal of Genetics and Plant Breeding is a periodical for the publication of records of original research in all branches of genetics, plant breeding and cytology including human genetics, molecular biology and other cognate sciences of immense importance as to be of primary interest to the geneticists and plant breeders. It has links with various disciplines such as genetics, horticulture, vegetable crops, plant physiology, microbiology, soil science and agricultural chemistry, entomology, plant pathology, nematology, nuclear science, water technology, economics, rural sociology, extension etc. Hence, due to its inter and multidisciplinary nature great efforts are required to build library resources that would serve the users effectively and at the same time would not be too cost prohibitive.

Two most significant factors i.e. information explosion in its varied form and the rising cost due to the recent drastic devaluation of rupee and the inflation abroad have posed a great problem to the librarians in acquisition. According to UNESCO there are over 6,00,000 documents being published every year in more than 80 written languages. Out of these documents, 3,00,000 alone are traditional books; 1,50,000 are periodicals and 1,50,000 other types of documents like reports, patents, papers etc. The world growth of scientific literature is estimated at 6 to 7% a year. The rate of growth is so rapid that the scientific literature is getting almost doubled every ten years.

Cost is another factor for concern. It is said that the price of books has gone up by 40% since January last (1991). Whereas the cost of periodicals keeps on increasing by 10 to 15% each year. According to a survey of expenditure incurred by Roorkee University, the cost of journals doubles every fourth year. This has outstripped the purchasing capacity of libraries all over the world. It is said that even a very rich library like the Library of Congress of the USA, whose budget is several crores of rupees, will not be able to procure each and every document that is being published from different parts of the world and in different forms. Therefore, to avoid difficulties created by the inflation on the one hand and the shrinking fund position on the other, a purposeful study of evaluating the types of literature and of selecting scientific periodicals according to their use value is of immediate interest and need. Hence, through the method of citation analysis an attempt has been made to prepare a rank list of journals in the field of Genetics and Plant Breeding.

PURPOSE OF THE STUDY

The main objective of the study is to prepare a rank list of journals in order of their merit in the field of genetics and plant breeding. Besides this, additional information was gathered on following aspects:

1. To identify the types of literature used in the field.
2. To make a comparative study of citations in periodicals and non-periodicals citation.
3. To find out the country of origin in the rank list of first 60 journals.
4. To study the chronological scattering of all citations.
5. To get an idea of contribution of foreign and Indian theses in the field.
6. To find out the Indian institutes which has produced the theses; and
7. To study the authorship pattern.

METHODOLOGY

In this endeavour the definition of periodicals has been strictly followed in categorization of types of literature. Accordingly, such documents which are being published more frequently than annually , in a numbered sequence, were taken as periodical publications. Otherwise they were considered as non-periodicals. Annuals, theses, reports, irregular colloquia/symposia/seminars/ conferences/workshops/meetings etc, abstract of irregular international symposia/congress etc, personal communications, papers presented in symposium, monographs without regular sequence, unpublished data, document in press and mimeograph were noted separately and treated as non-periodical publications.

For this study all citations mentioned at the end of the articles published in Indian Journal of Genetics and Plant Breeding from Vol. 45-49 (1985-1989) were taken as a base. This is the only Indian journal which has exclusively devoted itself to the field of genetics and plant breeding published by the Indian Society of Genetics and Plant Breeding. Each citation was noted in the same form as given by the author. In all, there were 4136 citations, which were collected, and analyzed (Table 1). Book reviews were excluded from the study. All citations were divided into two broad groups: periodical and non-periodical publications. Out of 4136 citations 3256 were from periodicals and 880 from non-periodicals (Table 2). Further, the slips of periodicals and non-periodicals were arranged according to their form of literature. Again the slips of journals were arranged in alphabetical order and then in order of their frequency. Thus, a rank list of 60 most cited journals was prepared in decreasing order of citations (Table 3). The Ulrich's International Periodicals Directory (26th ed, 1987) and World List of Scientific Periodicals (Ed 4, 1964) were consulted to find out the country of origin and year of publication of the journals. Thereafter the slips were arranged in different order such as geographically, chronologically and according to their

Table 1

Volumewise Analysis of Contributions

Volume No.	No. of issues	Year	No. of citing articles	No. of cited documents	%
45	1-3	1985	77	1013	24.49
46	1-3	1986	65	1195	28.89
47	1-3	1987	45	591	14.29
48	1-3	1988	72	649	15.69
49	1-3	1989	75	688	16.64
Total			334	4136	100.00

number of authors. At last, the slips of theses were arranged countrywise and then the Indian theses were rearranged institutionwise.

DISTRIBUTION OF SOURCE DATA

Five volumes of Indian Journal of Genetics and Plant Breeding (V.45-49; 1985-1989) were selected as source materials. The fifteen issues of these volumes contained a total of 4136 citations giving an average of 67 citing articles and 827.20 cited documents per volume. Thus, the overall average came to 12.38 citations per title. Table 1 gives a volumewise analysis of the number of citing articles and cited documents. It is very much surprising to note that these five volumes did not contain even a single short communication like other research journals.

BIBLIOGRAPHICAL FORMS OF THE CITED DOCUMENTS

Table 2 gives a comparative study of periodicals and non-periodicals citations. It reveals that out of

Table 2

Distribution of Citations based on the Bibliographical forms

Sl.No.	Periodicals.				Non-periodicals			
	Nature of Publications	No.of Citations	%	% in total	Nature of Publications	No. of Citations	%	% in total
1.	Journals	2895	88.91	69.99	Books	514	58.41	12.43
2.	Proceedings	151	4.64	3.65	Annuals	48	5.46	1.16
3.	Newsletters	86	2.64	2.08	Theses	124	14.09	3.00
4.	Bulletins	57	1.75	1.38	Reports	68	7.73	1.65
5.	Abstracts	21	0.64	0.51	Irregular Colloquium/ Symp./Semi./Conf./W.S/ Meetings etc.	58	6.59	1.40
6.	Reviews	21	0.64	0.51	Abst. of Irregular Intern. Symp./Cong.etc.	32	3.64	0.77
7.	Monographs	10	0.31	0.24	Monographs without regular sequence	4	0.45	0.10
8.	Transactions	9	0.28	0.22	Papers presented in symposium	17	1.93	0.41
9.	Memoir	6	0.19	0.14	Personal Commun.	7	0.81	0.17
10.	-	-	-	-	Unpublished data	4	0.45	0.10
11.	-	-	-	-	In Press	3	0.34	0.07
12.	-	-	-	-	Mimeograph	1	0.11	0.02
	Total	3256	100.00	78.72		880	100.00	21.28

Table 3

Rank List of most cited Journals

Sl.No.	R.No.	Name of Periodicals	Year of origin	Country of origin	No. of Cit.	Cum. no. of Cit.	%	Cum.
1.	1	Indian J Genet Plant Breed	1941	India	402	-	12.35	12.35
2.	2	Crop Sci	1961	U.S.A	266	668	8.17	20.52
3.	3	Indian J agric Sci	1931	India	114	782	3.50	24.02
4.	4	Euphytica	1952	Netherl.	98	880	3.01	27.03
5.	5	Theor appl Genet	1929	W.Ger	96	976	2.95	29.98
6.	6	Agron J	1907	U.S.A.	94	1070	2.88	32.86
7.	7	Heredity	1947	U.K.	81	1151	2.49	35.35
8.	8	Aust J biol Sci	1948	Aust.	57	1208	1.75	37.10
9.	9	Can J Genet Cytol	1959	Canada	40	1248	1.23	38.33
10.	9	Nature	1869	U.K.	40	1288	1.23	39.56
11.	10	Genetics	1916	U.S.A.	38	1326	1.17	40.73
12.	10	Z Pflanzenzuchtung	1913	W.Ger.	38	1364	1.17	41.90
13.	11	Cytologia	1929	Japan	36	1400	1.11	43.01
14.	12	Curr sci	1932	India	35	1435	1.07	44.08
15.	12	Proc natl Acad Sci USA	1915	U.S.A.	35	1470	1.07	45.15
16.	13	Indian Phytopathol	1948	India	32	1502	0.98	46.13
17.	14	Biometrics	1945	U.S.A.	31	1533	0.95	47.08
18.	14	Can J Pl Sci	1921	Canada	31	1564	0.95	48.03
19.	14	Envir exp Bot (formerly : Radiation Bot.)	1961	U.S.A.	31	1595	0.95	48.98
20.	14	Maize Genet Coop News) (Cymmit)	1927	Mexico	31	1626	0.95	49.93
21.	15	Madras agric J	1911	India	25	1651	0.77	50.70
22.	15	Science	1880	U.S.A.	25	1676	0.77	51.47

Contd.

Table 3(Contd.)

23.	16	J Heredity	1910	U.S.A.	24	1700	0.74	52.21
24.	17	Hereditas	1920	Sweden	22	1722	0.68	52.89
25.	18	Indian Farming	1940	India	21	1743	0.64	53.53
26.	19	Phytopathol	1911	U.S.A.	20	1763	0.62	54.15
27.	20	Pl Dis Reporter	1917	U.S.A.	19	1782	0.58	54.73
28.	21	Genet Agrar	1946	Italy	18	1800	0.55	55.28
29.	21	Jap J Breeding	1951	Japan	18	1818	0.55	55.83
30.	22	Aust J agric Res	1950	Aust.	17	1835	0.52	56.35
31.	22	Crop Improv	1947	India	17	1852	0.52	56.87
32.	22	Genetica	1919	Netherl.	17	1869	0.52	57.39
33.	23	Am Soc Hort Sci J (Formerly: Am Soc Hort Sci P)	1903	U.S.A.	16	1885	0.49	57.88
34.	23	Genetika	1966	USSR	16	1901	0.49	58.37
35.	23	J agric Sci Camb	1905	U.S.A.	16	1917	0.49	58.66
36.	23	Nucleus	1958	India	16	1933	0.49	59.35
37.	24	Can J Bot	1929	Canada	15	1948	0.47	59.82
38.	25	Jap J Genet	1921	Japan	14	1962	0.43	60.25
39.	26	Molec gen Genet	1908	W.Ger.	13	1975	0.40	60.65
40.	27	SABRAO J	1969	Malaysia	12	1987	0.37	61.02
41.	28	Cereal Res Commun	1973	Hungary	11	1998	0.34	61.36
42.	28	J Am chem Soc	1879	U.S.A.	11	2009	0.34	61.70
43.	29	Cell	1974	U.S.A.	10	2019	0.31	62.01
44.	29	Chromosoma	1939	W.Ger.	10	2029	0.31	62.32
45.	29	Indian J Mycol Pl Pathol	1971	India.	10	2039	0.31	62.63
46.	29	J agric Res	1962	U.K.	10	2049	0.31	62.94
47.	29	Am Soc Sugarbeet Technol J	1938	U.S.A.	10	2059	0.31	63.25
48.	29	Oryza	1961	India	10	2069	0.31	63.56

Contd.

Table 3(Contd.)

49.	29	Pl Physiol	1924	U.S.A.	10	2079	0.31	63.87
50.	29	Proc Indian Acad Sci	1935	India	10	2089	0.31	64.18
51.	29	Sci Culture	1935	India	10	2099	0.31	64.49
52.	30	Cereal Chem	1924	U.S.A.	9	2108	0.27	64.76
53.	30	Curr Genet	1980	U.S.A.	9	2117	0.27	65.03
54.	30	Econ Bot	1947	U.S.A.	9	2126	0.27	65.30
55.	30	J agric Fd Chem	1953	U.S.A.	9	2135	0.27	65.57
56.	30	J Genet	1910	India	9	2144	0.27	65.84
57.	30	J Res H.A.U.	1971	India	9	2153	0.27	66.11
58.	31	J Am Soc Agron	1910	U.S.A.	8	2161	0.25	66.36
59.	31	J Res P.A.U.	1964	India.	8	2169	0.25	66.61
60.	31	Indian J agric Res	1967	India	8	2177	0.25	66.86
514		Titles with 1 to 7 Citations.			1079	3256	33.14	100.00

4136 citations 3256 (78.72%) were from periodical publications comprising journals, proceedings, newsletters, bulletins, reviews, monograph, abstracts, transactions, memoirs etc and 880 (21.28%) from non-periodical publications consisting of books, annuals, theses, reports (technical, project, administrative, government, science, special annual and market), irregular proceedings, mimeographs, unpublished and press materials etc. Amongst all these, the journals contributed the highest (69.99%) followed by books (12.43 %). the remaining 17.58% were contributed by proceedings, newsletters, bulletins, annuals, theses, reports and others.

JOURNALS CITED MOST FREQUENTLY

A rank list of first 60 most cited journals with a minimum of 8 citations has been given in Table 3 which accounted for 66.86% of journal literature. These 60 journals are arranged in the decreasing order of number of citations recieved and then in alphabetical order amongst the same rank number. The remaining 33.14 % was contributed by as many as 514 journals which are given at the end as a single group just to avoid an unduly long list.

The table shows that the journal articles of Indian Journal of Genetics and Plant Breeding were scattered in 574 periodicals. However, most of the research work (50.70%) were published in 21 journals. In the rank list, the Indian Journal of Genetics and Plant Breeding occupied the first position with the highest citation number 402 (12.35%), which can be considered as a journal of paramount importance from the point of view of Indian geneticists.

Crop Science, Indian Journal of Agricultural Science, Euphytica, Theoretical and Applied Genetics and Agronomy Journal occupied the 2nd, 3rd, 4th, 5th and 6th place in the rank list with contributions of 8,17%, 3.50%, 3.01%, 2.95% and 2.88% respectively. It is very interesting to note that only these 6 titles contributed 32.86% citations whereas the next 54 titles accounted for 34.00% or near about just half of the total citations.

Table 4

Comparison of Ranking of the first 24 Journals of the present list with that of other lists.

Rank No.	Journal of the present ranking	Other ranking lists	
		Karand's list	Lal's list
1.	Indian J Genet. Pl Breed	1	1
2.	Crop Sci	2	2
3.	Indian J agric Sci	3	4
4.	Euphytica	21	-
5.	Theor appl Genet	15	-
6.	Agron J	5	3
7.	Heredity	12	-
8.	Aust J biol Sci	21	-
9.	Can J Genet Cytol	23	-
10.	Nature	-	-
11.	Genetics	7	-
12.	Z Pflanzenzuchtung	13	-
13.	Cytologia	24	-
14.	Curr Sci	6	-
15.	Proc natl Acad Sci USA	-	-
16.	Indian Phytopathol	-	-
17.	Biometrics	16	-
18.	Can J Pl Sci	-	-
19.	Envir exp Bot	-	-
20.	Maize Genet Coop Newsl	-	-
21.	Madras agric J	4	5
22.	Science	-	-
23.	J Heredity	18	-
24.	Hereditas	24	-

Table 5

Countrywise distribution of first 60 cited journals

Sl.No.	Country	No. of Journals covered	% of citations	No. of journals shared	% of citations
1.	USA	21	3.66	700	21.50
2.	India	16	2.79	736	22.60
3.	West Germany	4	0.70	157	4.82
4.	Canada	3	0.52	86	2.64
5.	Japan	3	0.52	68	2.09
6.	U K	3	0.52	131	4.02
7.	Australia	2	0.36	74	2.27
8.	Netherlands	2	0.36	115	3.53
9.	Hungary	1	0.17	11	0.34
10.	Italy	1	0.17	18	0.56
11.	Malaysia	1	0.17	12	0.37
12.	Mexico	1	0.17	31	0.95
13.	Sweden	1	0.17	22	0.68
14.	USSR	1	0.17	16	0.49
	Total	60	10.45	2177	66.86
15	Rest Titles	514	89.55	1079	33.14
	Grand Total	574	100.00	3256	100.00

The remaining 514 titles were responsible for 33.14% journal citations.

COMPARISON OF RANKING OF THE FIRST 24 JOURNALS OF THE PRESENT LIST WITH THAT OF OTHER LISTS.

Table 4 provides a comparison of the first 24 top ranking journals in the present list with Karande's list [10] and Lal's list [11]. It is quite noteworthy that Indian Journal of Genetics and Plant Breeding and Crop Science both have occupied the first and second position in all the three lists. The Indian Journal of Agricultural Science has occupied 3rd position in the present list and also in Karande's list but the same has got 4th position in Lal's list. It is observed from the table that upto serial no. 6, more or less position is the same and is considered most useful for the scientists working in the field. This shows that comparative studies help the librarian to select journals for their libraries with authenticity.

Karande prepared a rank list of 44 journals after analysing 1544 journal citations out of a total 1866 citations received from 10 M.Sc. and 5 Ph.D. theses submitted to Mahatma Phule Agricultural University, Rahuri between 1980 and 1989. Lal's rank list of only 5 most important journals in the field was based on stratified random sampling with proportional allocation. The study was made on the basis of 217 citations obtained from 2 Ph.D. theses (25% of the deposited theses) submitted to the department of Plant Breeding and Genetics, Rajendra Agricultural University, Bihar, Pusa during the year 1981-88. From such meagre data it is not possible to come to a definite conclusion regarding ranking of periodicals. Still, 4 titles from his table find place within the first 6 titles of the present list and the last title also occur at rank number 21 in the present list.

COUNTRYWISE DISTRIBUTION OF RANKED JOURNAL

Table 5 shows the geographical distribution of the first 60 ranked journals from 14 countries covering 2177 citations (66.86%) out of 3256.

Table 6

Chronological Distribution of Citations

Period of span	Periodical Publications						Non-periodical Publications							
	Journals	Procee-dings	News letters	Bulletins	Abstracts and Reviews	Others : (Mem., : Monog., : Trans.) :	Books	Annuals	Reports	Theses	Irreg. Colloq. Sym/Sem. Conf./: Workshop	Other	Total	Percen-tage
Before 1900	4	-	-	-	-	-	1	-	-	-	-	-	5	0.12
1901-10	2	-	-	1	-	-	-	-	1	-	-	-	4	0.10
1911-20	6	-	-	2	1	1	1	-	-	-	-	-	11	0.26
1921-30	19	-	-	5	-	1	3	-	5	-	1	1	35	0.85
1931-40	64	1	-	3	-	2	6	-	4	1	-	2	83	2.01
1941-50	89	1	-	3	1	1	8	1	-	-	-	-	104	2.51
1951-60	325	9	2	8	5	1	85	2	3	1	2	2	445	10.76
1961-70	687	25	14	11	14	5	106	8	16	11	14	6	917	22.17
1971-80	1105	94	12	17	16	8	185	21	22	59	21	25	1585	38.32
1981-88	594	21	58	7	5	6	119	16	17	52	20	32	947	22.90
Total percen-tage	2895 69.99	151 3.65	86 2.08	57 1.38	42 1.02	25 0.60	514 12.43	48 1.16	68 1.65	124 3.00	58 1.40	68 1.64	4136 100.00	100.00

Table 7

Countrywise Distribution of Theses

Sl.No.	Country	M.Sc/ M.Sc.(Ag.)	M.Phil.	Ph.D.	Total	%
1.	India	23	1	82	106	85.48
2.	USA	1	-	9	10	8.06
3.	Israel	1	-	1	2	1.61
4.	Nigeria	1	-	1	2	1.61
5.	Australia	-	-	1	1	0.81
6.	Belgium	-	-	1	1	0.81
7.	Canada	-	-	1	1	0.81
8.	Philippines	1	-	-	1	0.81
	Total	27	1	96	124	100.00
	%	21.77	0.81	77.42	100.00	

Table 8

Institutionwise Scattering of Indian Theses

Sl. No.	University	M.Sc./ M.Sc. (Ag.)	M.Phil.	Ph.D.	Total	%
*1.	I.A.R.I., New Delhi.	4	-	34	38	35.85
*2.	P.A.U., Ludhiana	4	-	6	10	9.44
*3.	H.A.U., Hissar	4	-	5	9	8.49
4.	Agra University, Agra	-	-	6	6	5.66
*5.	G.B.P.U.A.T., Pantnagar	-	-	5	5	4.73
6.	Kanpur University, Kanpur	-	-	5	5	4.73
7.	B.H.U., Varanasi	-	-	2	2	1.89
*8.	C.S.A.,U. Agric & Tech. Kanpur.	1	-	1	2	1.89
9.	Delhi University, Delhi	-	-	2	2	1.89
*10.	Kerala Agric Univ. Trichur	2	-	-	2	1.89
*11.	Marathwada Agric Univ. Parvani	1	-	1	2	1.89
12.	Osmania Univ. Hyderabad	-	-	2	2	1.89
*13.	Univ of Agric Sci, Dharwad	1	-	1	2	1.89
14.	University of Udaipur	1	-	1	2	1.89
15.	Aligarh Muslim Univ. Aligarh	-	1	-	1	0.94
*16.	A.P.U., Hyderabad	1	-	-	1	0.94
17.	Calcutta University	-	-	1	1	0.94

Contd.

Table 8 (Contd.)

*18.	Gujrat Agric Univ	1	-	-	1	0.94
19.	I I T, Kharagpur	-	-	1	1	0.94
*20.	J N K V V, Jabalpur	1	-	-	1	0.94
21.	Kakatya Univ, Warangal	-	-	1	1	0.94
22.	Karnataka Univ, Dharwar	-	-	1	1	0.94
*23.	M.P.K.V., Rahuri	-	-	1	1	0.94
24.	Meerut Univ, Meerut	-	-	1	1	0.94
25.	Rajasthan Univ, Jaipur	-	-	1	1	0.94
26.	Sardar Patel Univ, Ballabh-vidya Nagar, Anand	-	-	1	1	0.94
27.	Sukhadia Univ, Udaipur	1	-	-	1	0.94
*28.	T.N.A.U., Coimbatore	-	-	1	1	0.94
29.	University of Madras	-	-	1	1	0.94
30.	University of Poona	1	-	-	1	0.94
31.	Utkal University, Bhubaneswar	-	-	1	1	0.94
	Total	23	1	82	106	100.00
	%	21.70	0.94	77.36	100.00	

**Agricultural University*

Table 9

Distribution of Total Citations according to No. of Authors.

Sl.No.	Types of documents	Single	Double	Three	Four	Five	More than Five	Anony-mous	Total
1.	Periodicals	1006	1330	620	222	46	24	8	3256
2.	Non-periodicals	508	207	79	26	11	6	43	880
	Total	1514	1537	699	248	57	30	51	4136
	%	36.61	37.16	16.90	6.00	1.38	0.72	1.23	100.00

Though USA had produced the highest number of journal titles (21) compared to India (16) in the subject, Indian journals had more number of citations (736) than USA(700). After USA and India, the most important countries whose journals were most referred to were West Germany (0.70%), Canada, Japan, U.K. (0.52% each), Australia and the Netherlands (0.36% each). The rest six countries i.e. Hungary, Italy, Malaysia, Mexico, Sweden and USSR each was responsible for 0.17% of journals. The table shows that the Indian researchers in the field of genetics and plant breeding mostly depend on American journals.

CHRONOLOGICAL DISTRIBUTION OF CITATIONS

In order to identify the period from which the literature was frequently used, chronological distribution of all the 4136 citations was made. The period of citations was divided into decennium. Table 6 shows that about 38.32% cited literature, irrespective of documents, were published during the year 1971-1980 followed by those published during 1981-1988 having been cited 22.90%. It is seen from table that older documents were less cited than the later ones. Nearly 5.85% of the total citations appeared during the first half century which indicates less orientation of research at that period in the field of genetics and plant breeding.

The use of citations increases with the year, and the trend of citing the most recent literature in the field shows a phenomenal increase in the publication of literature after 1950. This study will be very useful and assuring to the librarians in the weeding out as well as in the acquisition of back volumes of journals.

DISTRIBUTION OF CITED THESES

Table 7 gives the geographical distribution of cited theses. From Table 2 it is clear that theses, as a type of literature occupied the fourth place next to journals, books and proceedings. A total of 124 theses produced by eight countries of the world were cited. Amongst them, India occupied the first place accounting for 85.48% followed by USA (8.06%), Israel and Nigeria (1.61 % each). Australia, Belgium, Canada and Philippines each contributed 0.81% theses citations.

INSTITUTIONWISE SCATTERING OF INDIAN THESES

In order to find out the universities according to their contribution in the field, all the theses citations were arranged institutionwise (Table 8).

Out of 106 Indian theses citations, the maximum (77.30%) were from Ph.D. followed by M.Sc.(21.70%) and M.Phil. (0.94%) workers.

It is observed from the table that Indian Agricultural Research Institute (IARI), New Delhi topped the list with 35.85% theses citations followed by PAU, Ludhiana (9.44%), HAU, Hissar (8.49%); Agra University (5.66%), G.B.P.U.A.T., Pantnagar and Kanpur University (4.73% each). Besides, eight universities contributed a total of 15.12% (1.89% each) and seventeen contributed together 15.98% (0.94% each).

It is also obvious from the table that out of 31 universities, 13 were agricultural universities, whose contribution was as high as 70.75% out of the total Indian theses citations.

AUTHORSHIP PATTERN

The study of authorship pattern reflects the research trend in the field of genetics and plant breeding. Table 9 shows the distribution of citations according to the number of authors in periodicals and non-periodicals separately. The table depicts that 36.61% citations were contributed by single authors, 37.16% by double authors, 16.90% by three authors, 6.00 % by four authors and 2.10% by five and more than five authors. Besides, 1.23% were contributed by anonymous authors i.e. only 36.61% were by single authors and 62.16% by two and more than two authors.

The study clearly indicates that team research is the trend in the field of genetics and plant breeding as against the trend of individual research in anthropology.

CONCLUSION

The analysis of citations received from the Indian Journal of Genetics and Plant Breeding shows that the major source of information from the Indian scientists' point of view are journals (69.99%) followed by books (12.43%) and proceedings (3.65%). The remaining sources such as theses, newsletters, reports, bulletins and others account together for 13.93% only.

The rank list of primary journals can serve as a tool in selection of core periodicals in the field. The comparison of the present rank list with those of others will help the librarian in establishing the rank of important journals in the field.

As regards the geographical distribution, USA and India both are the major contributors (44.10%) of journals in the field.

The documents published during the later half of the century are the preferred source of citations and use of which journals source is the highest (2711).

The data also reveals that team research is the trend of the present day and is dominant over solo research in experimental science.

India is the main user of theses literature (85.48%) followed by USA (7.25%). The remaining seven countries were responsible for 7.27% only. among the Indian theses citations, Indian Agricultural Research Institute, New Delhi is the major contributor in the field followed by PAU, Ludhiana and HAU, Hissar.

REFERENCES

1. Phandnis, S.P., Soaib Ahsan, A and Vijayalakshmi, N.R. : Training of agricultural scientists in information use. J.Lib Inf.Sci. 1977, 2(2), 151-181.
2. Kaula, P.N.; Problems of research about the Indian Ocean area. Herald of Lib. Sci. 1980, 19, 259-
3. Eare, P and Vickery, B.C. : Aslib Proc. 1969, 21, 257- [Quoted by A.J. Meadows, Communication in Science, 1974, Butterworths, London, p.90]
4. Rama Tirtha: Resource sharing prospects in the agricultural universities and institution of higher learning and research in Uttar Pradesh. In : Planning in Library Resource Sharing (Eds. A S Chandel and Veena Saraf) 1987, Print House, Lucknow, p. 135
5. Mittal, T.C.: Publishing in India. 1991, 12 (10) Front Page.
6. Saxena, R.S.: Cooperation in acquisition and usages of periodicals among scientific and technical libraries of Uttar Pradesh [In : planning in library resource sharing (Eds. A S Chandel and Veena Saraf), 1987, Print House, Lucknow, p.146]
7. Ibid.
8. Kaula, P.N.: Towards resource sharing in libraries. [In: Planning in library resource sharing (Eds. A S Chandel and Veena Saraf) 1987, Print House, Lucknow, p.5]
9. Smith, Lynn S : A practical approach to serials cataloguing. Foundations of Library and Information Science, V.2 1978, JAI Press, Greenwich, p.4.
10. Karande, A.G. and Borle, U.M: Literature use pattern in cytogenetics and plant breeding: A citation analysis of theses. Indian J. Agric. Lib. Inf. Sc. (IJALIS). 1990, 18, 32-41.
11. Arjun Lal: A trend in citation pattern in agriculture research in Bihar. IASLIC Bulletin. 1989, 34(2), 65-72.
12. Aravinda, P. and Pulla Reddy, V: Physical anthropological literature: a citation analysis, ILA Bulletin. 1989, 25(1), 19-25.

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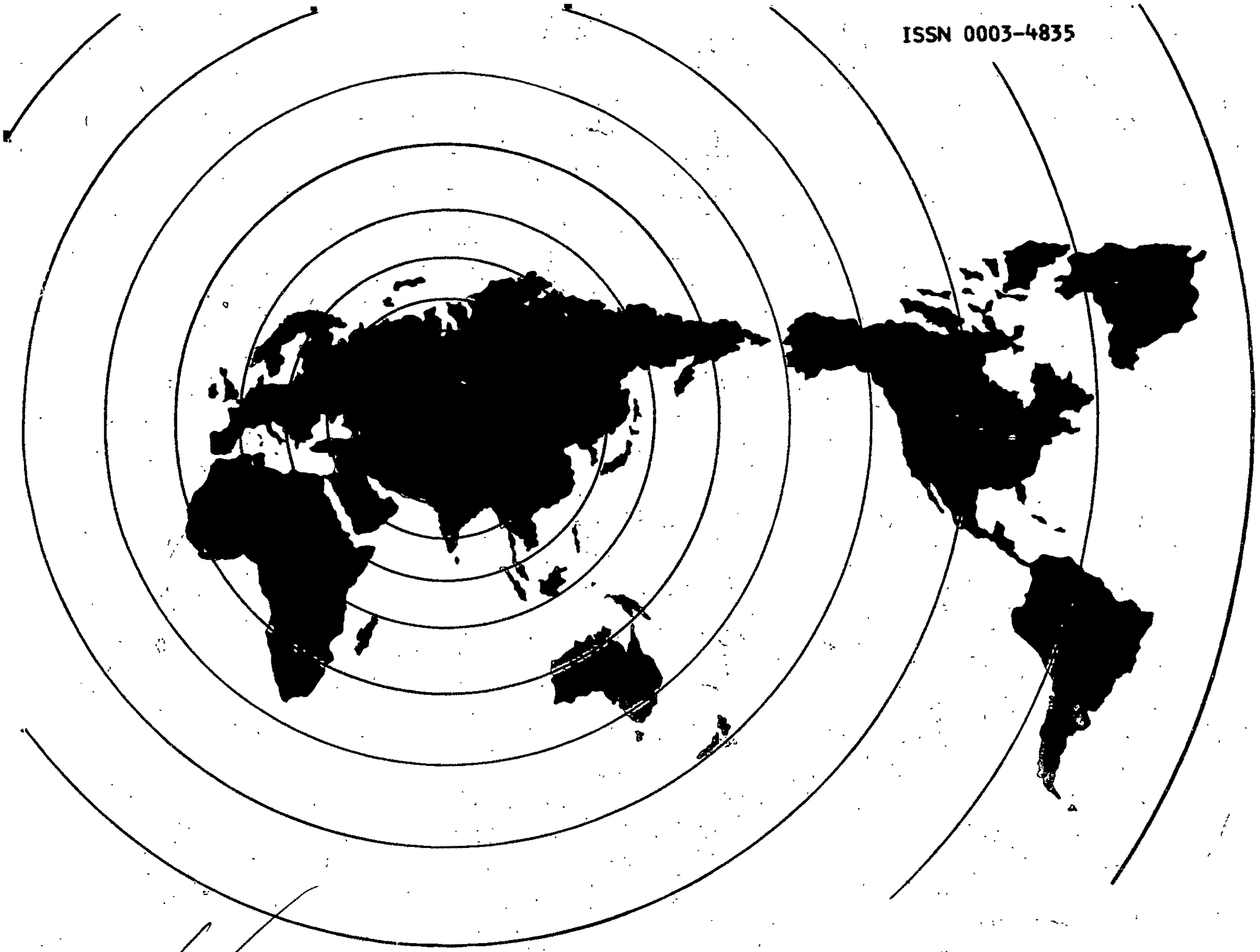

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ELEVEN YEARS OF CBRI RESEARCH OUTPUT, 1980-90 - A BIBLIOMETRIC STUDY

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CBRI research output, 1980-90 is the bibliometric study of research papers contributed by the scientists of CBRI Roorkee in the form of articles published in Indian and foreign periodicals and papers presented in national and international conferences. The study indicates the downward trend of the institute's research output. Suggestions are made to improve the situation by taking more R&D projects in future, keeping in view the needs of the country. A list of suggested journals with their rankings, impact factors and immediacy index is given. If CBRI scientists publish their work in some of these journals, the CBRI work will have better visibility to scientific community.

INTRODUCTION

The Central Building Research Institute is one of the engineering laboratories of the Council of Scientific and Industrial Research (C.S.I.R.). Its scientists have been generally publishing their works in journals (both Indian and foreign) and presenting papers in the national and international conferences. CBRI scientists are contributing papers and articles to 94 periodicals with varying impact factors (Table 1) and a number of national and international conferences which shows that the contribution of CBRI to the advancement of knowledge in diverse fields is significant.

A study is undertaken for systematic bibliometric analysis of the papers published by the scientists of CBRI in research journals of Indian and foreign origin and papers presented in the national and international conferences during 1980-90 to make an assessment of the impact of the research papers published by the CBRI scientists on scientific activity and assessment of implementation of the projects in the laboratory (Charts 3 &4).

METHODOLOGY

822 research papers were published by the scientists of CBRI during January 1980 to March 1990. Each paper was categorised on the basis of the journal in which it appeared and to the division to which it belonged.

It is observed that the journals in various fields of science such as physics, chemistry, biology, microbiology, drugs, etc. are covered by the Science Citation Index (SCI) and are regularly analysed in the Journal Citation Report (JCR). It is unfortunate that the engineering journals have not attracted much attention of SCI and therefore their impact factor, immediacy index, self-citation rate etc. are not known.

Impact Factor (IF): It is the ratio between the number of times a journal is cited and the number of citable articles published by the journal in a given span of time.

Immediacy Index: It is the rate at which an article is cited during the year of its publication.

Self Citation Rate : It is the rate at which an article cites itself.

IMPACT FACTORS OF JOURNALS OF INTEREST TO CBRI

The reputed journals in civil engineering which are covered by the Science Citation Index provide the basis for assigning impact factors to other journals in the same discipline. In every discipline of interest to CBRI, subject experts were also approached to make their judgement in assigning impact factors and guiding average was taken as the recommended values. For instance, the Journal of Geotechnical Engineering (American Society of Civil Engineers, New York) is assigned

Table 1

Impact Factor of Indian and Foreign Journals

Sl. No.	Title of Journal	I.F.
1.	ACI Structural Engineering (USA)	0.001
2.	Architects Trade Journal(INDIA)	0.001
3.	Architectural Science Review (AUSTRALIA)	0.222
4.	Bricks & Tile News (ANN No.) (INDIA)	0.010
5.	Builder's Friend (INDIA)	0.001
6.	Building & Environment (UK)	0.100
7.	Building & Prefabrication (UK)	0.010
8.	Building Research & Practice (UK)	0.035
9.	Cement (INDIA)	0.020
10.	Cement & Concrete Research (UK)	0.200
11.	Cement Industry (ANNUAL) (UK)	0.010
12.	Cera Murgia (ITALY)	0.010
13.	Changing Indian Village (INDIA)	0.001
14.	Chemical Age of India (INDIA)	0.010
15.	Chemical Era (INDIA)	0.001
16.	Civil Engg Construction Rev (INDIA)	0.001
17.	Construction Building Technology (INDIA)	0.060
18.	Corrosion Bulletin (INDIA)	0.020
19.	Design incorporating Indian Builder (INDIA)	0.010
20.	Durability of Building Materials (HOLLAND)	0.201
21.	Electrochemical Society of India (INDIA)	0.080
22.	Electrochemistry (INDIA)	0.080
23.	Engineering Construction Review (INDIA)	0.010
24.	Energy Management (INDIA)	0.010
25.	Euroclay (UK)	0.010
26.	Fire Engineer (UK)	0.200
27.	Fire Safety Journal (USA)	0.200
28.	Fire Technology (UK)	0.201
29.	Indian Architect (INDIA)	0.001
30.	Indian Architect Builder (INDIA)	0001
31.	Indian Ceramics (INDIA)	0.050
32.	Indian Concrete Journal (INDIA)	0.050
33.	Indian Construction (INDIA)	0.001
34.	Indian Geotechnical Journal (INDIA)	0.060
35.	Indian J Environ Health (INDIA)	0.189
36.	Indian J Pure & Appl Physics (INDIA)	0.124
37.	Indian J Power & River Vall Dev (INDIA)	0.004
38.	Indian J Technology (INDIA)	0.130
39.	Indian J Textile (INDIA)	0.001
40.	Indian Planner and Builder (INDIA)	0.001
41.	Indian Surveyor (INDIA)	0.010
42.	Indian Standards Bulletin (INDIA)	0.001
43.	Inter. J Dev. Technology (THAILAND)	0.010
44.	Inter. J Environ Studies (UK)	0.100
45.	Inter. J Num. & Analyt. Meth. in Geo. Mech. (UK)	0.740

contd..........

46.	Inter. J Num. Meth. in Engg. (UK)	0.941
47.	Inter. Library Movement (INDIA)	0.001
48.	ISI Bulletin (INDIA)	0.005
49.	J Chem. Tech. & Bio-Tech. (UK)	0.353
50.	J Colour Society (INDIA)	0.001
51.	J Energy Management (INDIA)	0.010
52.	J Engineering Design (INDIA)	0.001
53.	J Geotech. Engg. Div. Proc. of ASCE (USA)	0.471
54.	J Indian Acad. of Wood Sci. (INDIA)	0.001
55.	J Indian Instt. of Arch. (INDIA)	0.001
56.	J Indian Road Congress (INDIA)	0.020
57.	J Indian Water Works Assoc. (INDIA)	0.060
58.	J Inst. of Engg. Arch (INDIA)	0.020
59.	J Inst of Engrs (India)-Chem (INDIA)	0.020
60.	J Inst of Engrs (India)-Civil) (INDIA)	0.020
61.	J Engrs (India)-Env. (INDIA)	0.010
62.	J Inst of Engrs (India)-Hindi (INDIA)	0.010
63.	J National Building Organisation (INDIA)	0.010
64.	J Oil & Chemical Assoc. (UK)	0.250
65.	J Optics (USA)	1.411
66.	J School Plan Arch. (INDIA)	0.001
67.	J Sc & Ind Researach (INDIA)	0.248
68.	J Structural Engg: ASCE (USA)	0.515
69.	Khadi Gram Udyog (INDIA)	0.001
70.	Meri Journal (INDIA)	0.001
71.	Metal & Mineral Rev (INDIA)	0.010
72.	Paint India (INDIA)	0.300
73.	Periodica Polytechnica (POLAND)	0.010
74.	Plastics Rubb & Mat Appl (UK)	0.004
75.	Polytechnica (POLAND)	0.010
76.	Popular Plastics & Rubber (UK)	0.001
77.	Pragati Nirman (INDIA)	0.001
78.	Pragya (INDIA)	0.001
79.	Proceedings of ASCE (USA)	0.100
80.	Process & Plant Engg. (INDIA)	0.001
81.	Research & Industry (INDIA)	0.726
82.	Salt Research Industry (INDIA)	0.001
83.	Science Reporter (INDIA)	0.001
84.	Science Today (INDIA)	0.001
85.	Soil Mechanics and Found Engg (JAPAN)	0.019
86.	Tata Energy Research (INDIA)	0.019
87.	Trans of Indian Ceramics (INDIA)	0.050
88.	Trans of Indian Soc of Des Tech (INDIA)	0.050
89.	Tunnelling & Und Ground space Tech (USA)	0.200
90.	Urja (INDIA)	0.001
91.	Vigyan Pragati (INDIA)	0.001
92.	Voluntary Action (INDIA)	0.001
93.	Yojana (INDIA)	0.001
94.	Zement Kalk Gips (GERMANY)	0.762

CHART - 1

YEARWISE CONTRIBUTION IN INDIAN AND FOREIGN JOURNALS

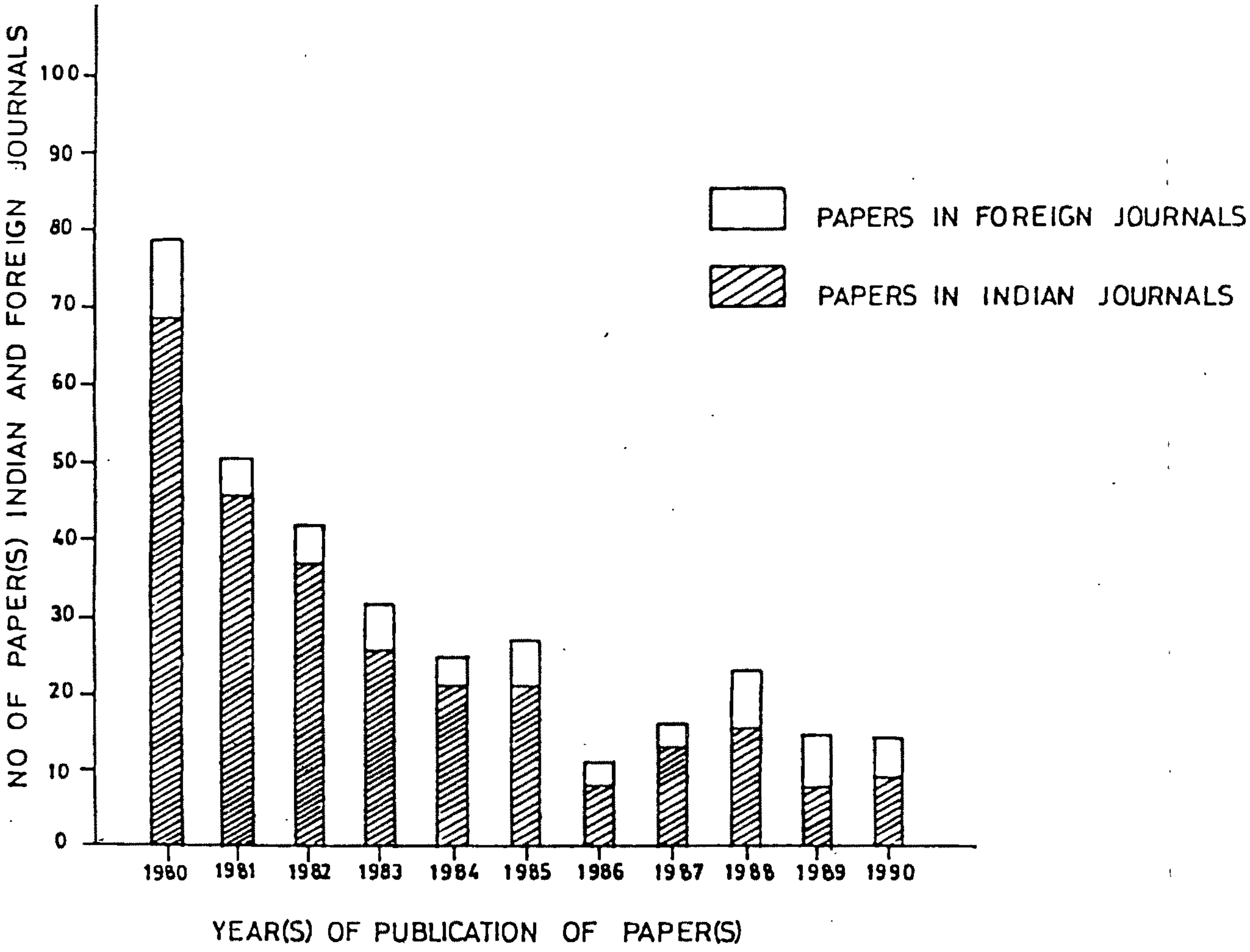


CHART - 2

DIVISIONWISE DISTRIBUTION OF PAPERS IN INDIAN AND FORIEGN PERIODICALS

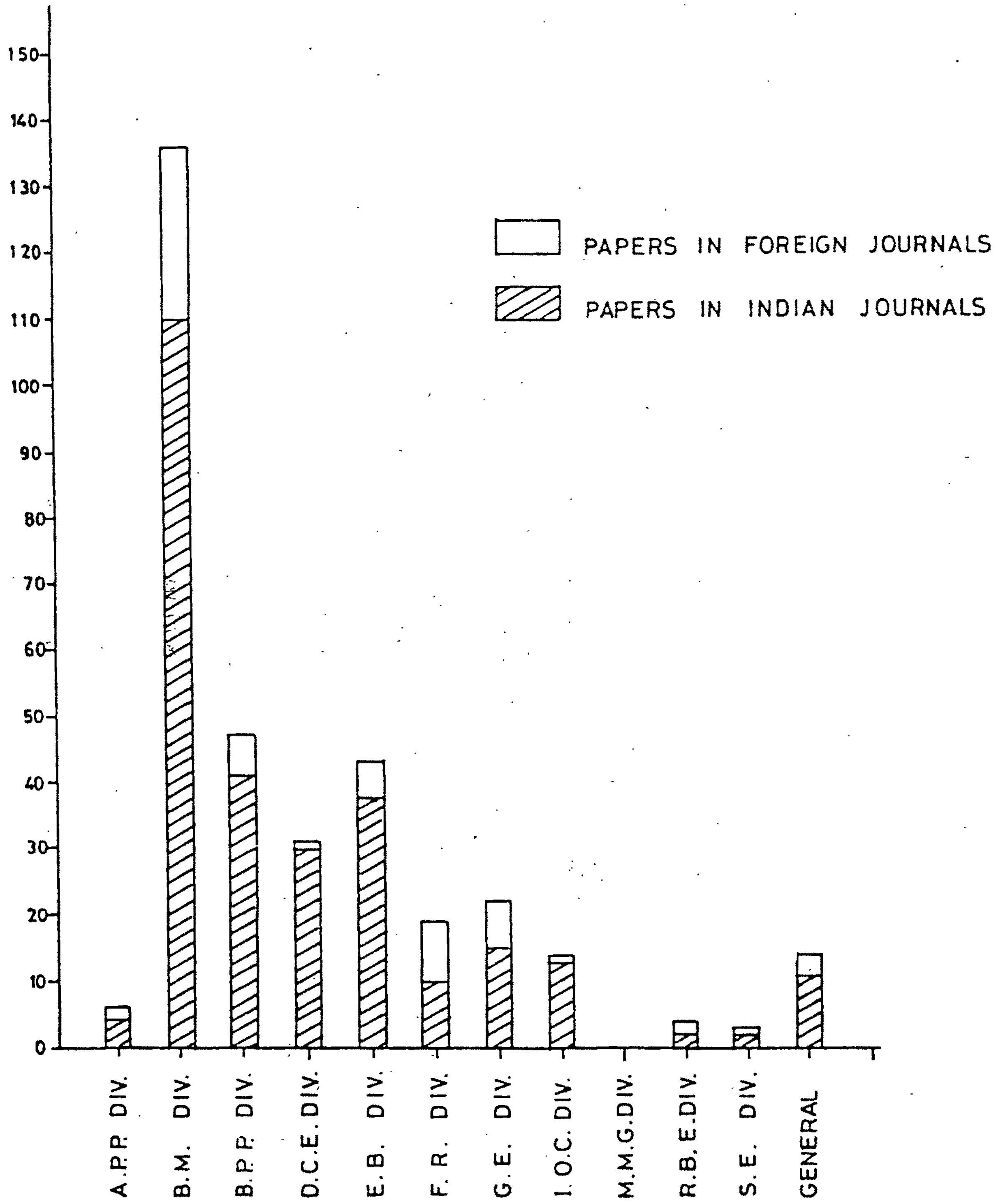


CHART - 3

CONTRIBUTION IN NATIONAL AND INTERNATIONL CONFERENCES 1980-1990

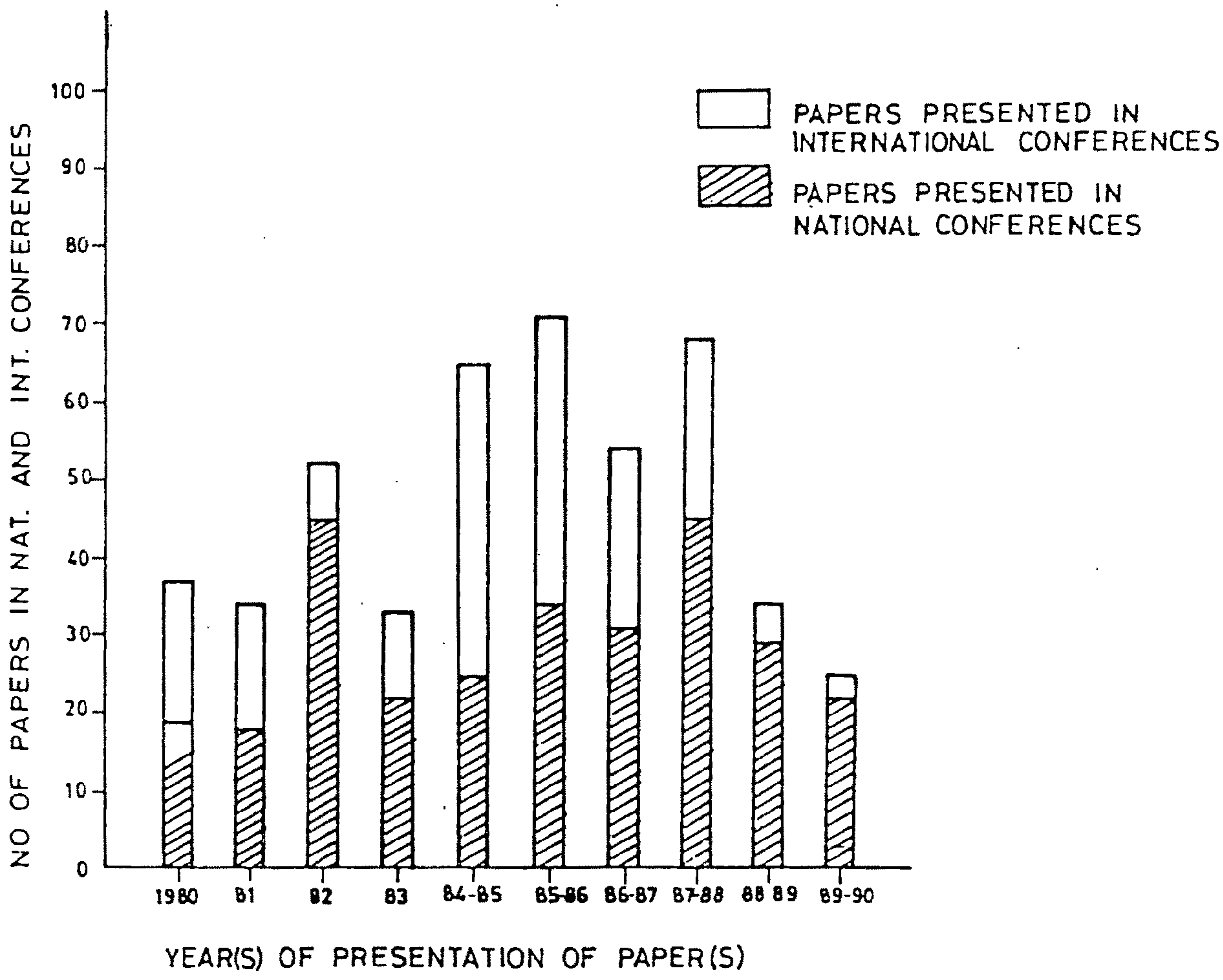


CHART - 4

DIVISIONWISE CONTRIBUTION IN NATIONAL AND INTERNATIONAL CONFERENCES

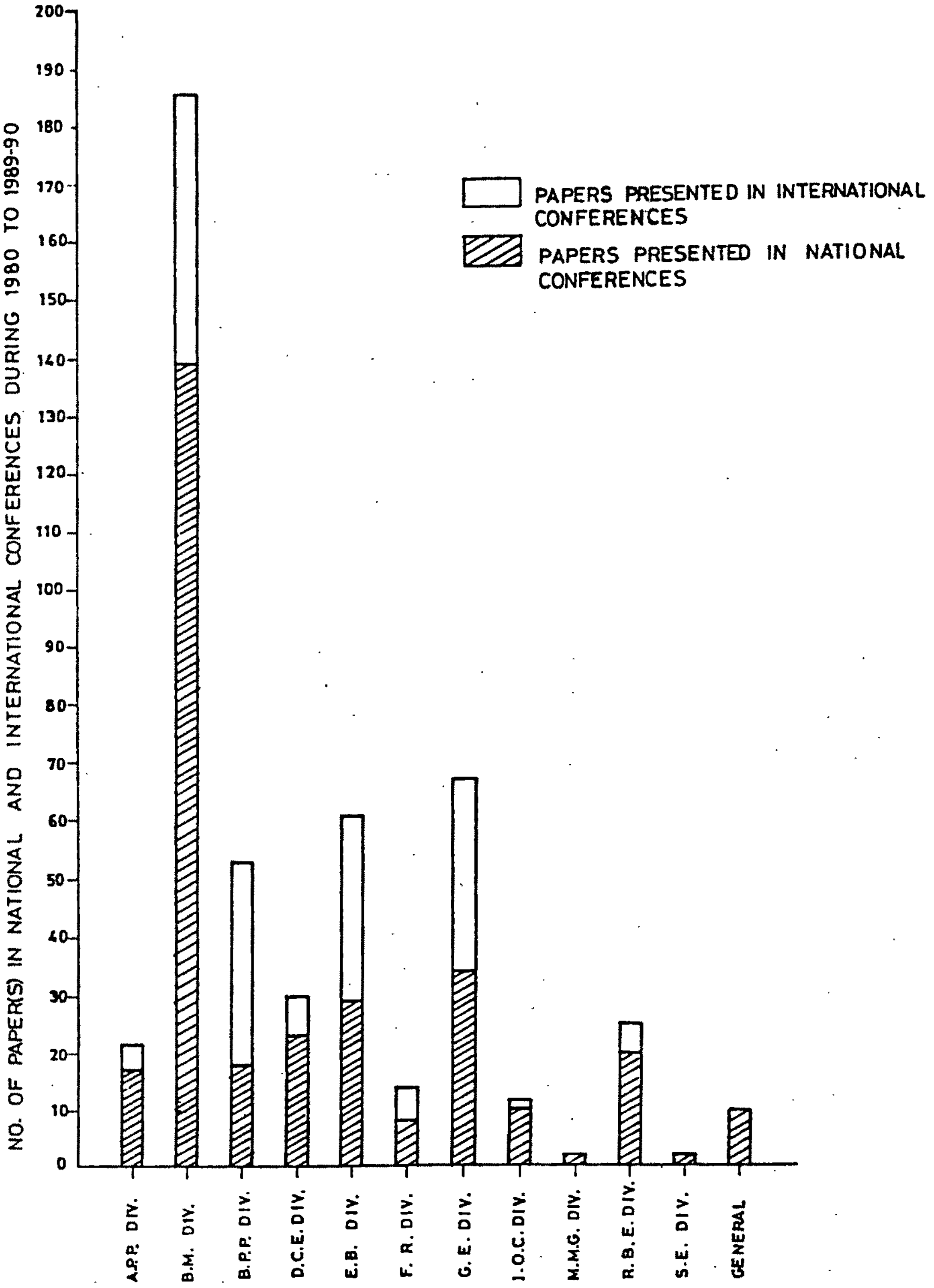
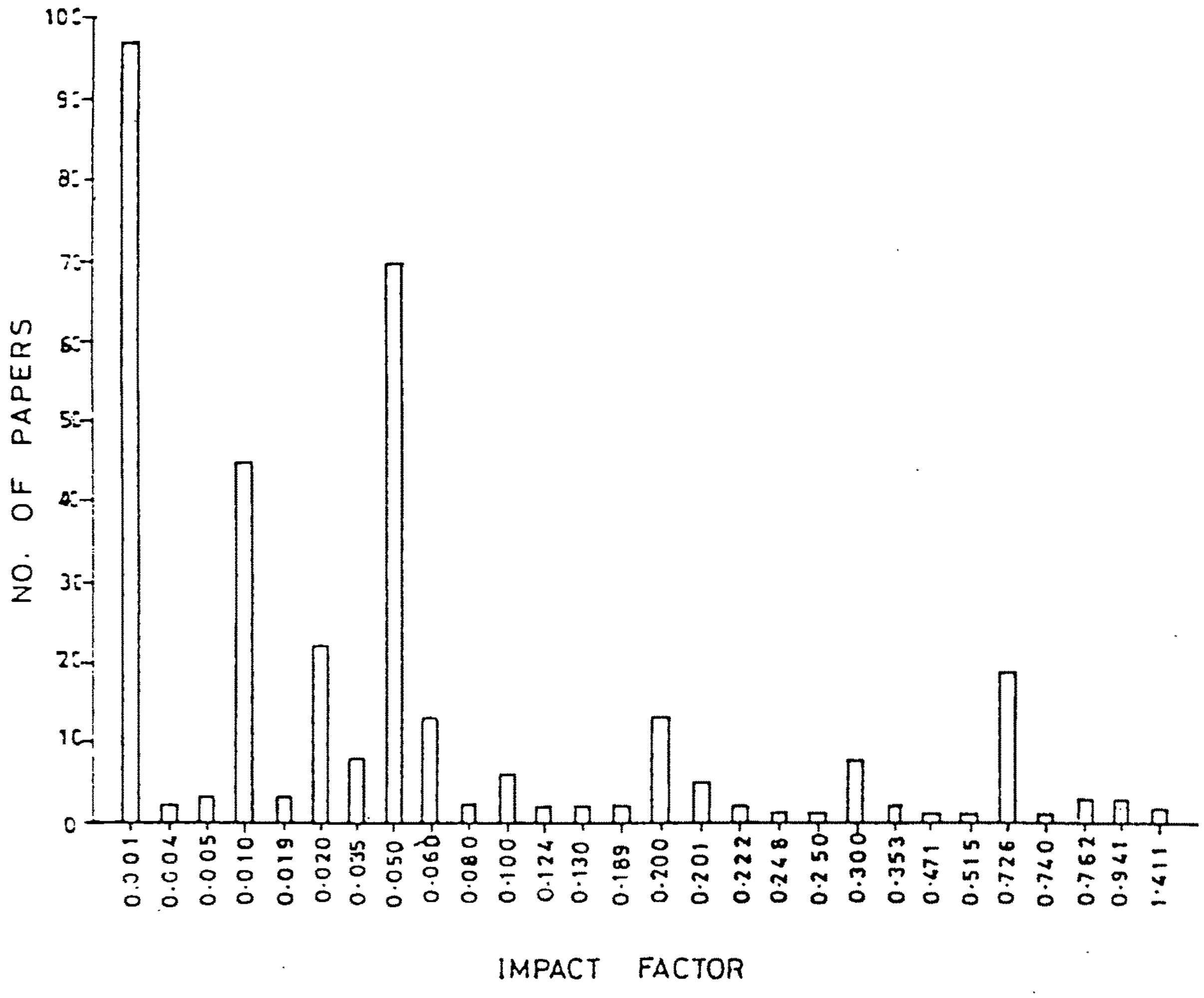


CHART - 5

IMPACT FACTOR OF PAPERS IN INDIAN AND FOREIGN JOURNALS (1980-90)



the Impact Factor of 0.471 by SCI (1988). Keeping this value in view, the impact factors for other journals like Indian Geotechnical Journal were arrived at, by keeping in consideration the relative merits and demerits. The total of impact factors of 339 papers published by the CBRI scientists during 1980-90 in Indian and foreign journals calculated in the manner specified above, worked out to be 36.006. It, therefore, follows that average impact factor per article lies close to 0.112 (Table 4).

The above analysis clearly indicates that the impact factors, worked out by taking the impact factors of a few outstanding civil engineering journals assigned by the SCI as the basis, would grossly underestimate the merit of papers in most other engineering journals. This is because the IF of papers published in the best of engineering journals fall way behind the IF of the front line disciplines viz. physics, chemistry and biology. Quite clearly, IF depends also on the status of a given discipline in the world of science and the scales tilt in favour of journals in such disciplines as are adequately covered by SCI. The professionals in the civil engineering laboratories have come to the conclusion that the journal published by the American Society of Civil Engineers, is amongst the best in the world and for this publication, the impact factor value assigned by SCI is just 0.471 as compared to the best journal, i.e. Biological Chemistry where the assigned value of impact factor is to the tune of 6.000 or even more. The evaluation of performance of the scientists in engineering laboratories, therefore, cannot be appropriately done by the kind of approach followed in the above anlysis. In fact, Eugene Garfield, one of the authorities on the theory and application of citation analysis, has time and again drawn attention to the differences in the citation characteristics that exist between the literature of different fields of science. More recently, Corneliers le Paier has argued in favour of not applying citation analysis to technology like applied sciences, engineering, instrumentation, etc., where patenting, product design and manufacturing are more important than paper writing and citing a paper.

ANALYSIS OF RESEARCH OUTPUT

339 articles from CBRI scientists were published in 94 jounrals. 79 articles were published in the year 1980. The research output of CBRI shows a zigzag trend during 1981 to 1990 (chart 1). It is also observed that there has been a declining trend duriing 1989 to 1990.

The study also shows that CBRI scientists prefered some Indian journals to publish their papers during 1980-1990 as shown below :

Name of the Journal	No. of Papers
Indian Concrete Journal	44
Indian Ceramics	22
Research and Industry	19
Journal of Instn. of Civil Engineers	12
Indian Construction	11
Indian Geotechnical Journal	11
Indian Architect	11
Paint India	8

Similarly, some selected foreign periodicals chosen by CBRI scientists to publish their papers are:

Name of the Journal	No. of Papers
Building Research and Practice	10
Cement and Concrete Research	8
Durability of Building Materials	3

By and large, it was found that 97 papers were published in substandard journals. It is suggested that CBRI building material chemists must publish some of their articles in Indian Journal of Chemistry Section A and B published by CSIR, Delhi.

Table 2 gives year-wise distribution of papers published in Indian and foreign journals. The preference of CBRI scientists to publish in Indian journals is established by the fact that as many as 278 papers were published by them in Indian journals. This may be due to the fact that papers in Indian journals are easily accepted, because of the weak refereeing system.

It is heartening to note that the CBRI technology could be published in 61 foreign journals despite the fact that the foreign periodicals are quite strict in accepting papers for publication. Only top class papers are accepted by them.

Table 3 and Chart 2 shows division-wise distribution of papers in Indian and foreign journals.

The Building Materials Division is found to have maximum number of papers to its credit. This may be attributed to the fact that the division is also having maximum number of scientific staff. In all, 136 papers (Table 3) were published by the division of which 110 papers appeared in Indian journals and 26 in foreign journals. Mathematical Modelling Group did not publish any paper in this decade as it was established in 1989 only.

Table 4 shows contribution of CBRI scientists in national and international conferences/seminars during the period. 483 papers were presented by CBRI scientists in various national/ international seminars/symposia. It is to be noted that papers are more easily accepted in the conferences than in Indian and foreign journals. Probably, this is the reason that as many as 483 papers were presented in various conferences, compared to 339 published in Indian and foreign journals.

From the table, it is evident that the Building Materials Division presented 185 papers in various conferences, of which 139 papers were presented in national and 46 papers in international conferences.

The Geotechnical Engineering Division presented 67 papers in various conferences. It is interesting to note that the division presented 34 papers in international conferences indicating good quality of research work.

The scientists of the Efficiency of Buildings Division have presented more papers (32) in international conferences than in national conferences (29). This may indicate that the CBRI technology in the area of building technology is more acceptable to foreign countries. Table 6 gives the impact factor of journals in which CBRI scientists published their papers. The total impact factor of 339 articles during the period 1980-90 is 38.371. The average impact factor per article is 0.113. The bar chart 5 clearly shows that maximum number of articles (i.e. 97) are published in the journals having very low impact factor i.e. 0.001. On the impact factor-based evaluation of publications, it was found that 28.6% of articles were published in the journals having impact factor 0.001, i.e., very low, 56.9% of articles were published in the journals having impact factor 0.004 to 0.200 (i.e. low to moderate), 5% of articles were published in the journals having impact factor 0.201 to 0.300 (i.e. moderate) and 9.4% of articles were published in the journals having impact factor 0.353 to 1.411 (i.e. quite high).

CONCLUSIONS

India is one of the countries having the largest scientific manpower in the world and the scientists are publishing their research outputs in more than thousand Indian and foreign periodicals. Such a large volume of scientific activity cannot be brushed aside. It is important to note

Table 2

Year-wise Distribution of Papers in Indian and Foreign Journals

Sl No.	Year	Indian journals	Foreign journals	Total
1.	1980	69	10	79
2.	1981	46	5	51
3.	1982	38	5	43
4.	1983	26	6	32
5.	1984	21	4	25
6.	1985	22	6	28
7.	1986	9	3	12
8.	1987	14	3	17
9.	1988	16	7	23
10.	1989	8	7	15
11.	1990	9	5	14
	Total	278	61	339

Table 3

Division-wise Distribution of Papers in Indian and Foreign Journals

S No.	YEAR(S)	APP DIV		BM DIV		BPPP DIV		DCE DIV		EB DIV		FR DIV		GE DIV		IOC DIV		MMG DIV		RBE DIV		SE DIV		GENERAL		TOTAL PUB.
		IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	IJ	FJ	
1.	1980	1	1	24	3	7	2	6	-	10	2	2	1	6	1	6	-	-	-	3	-	-	-	4	-	79
2.	1981	-	-	12	3	7	2	8	-	8	-	4	-	3	-	4	-	-	-	-	-	-	-	-	-	51
3.	1982	1	-	15	-	6	-	1	-	11	2	1	3	1	-	2	-	-	-	-	-	-	-	-	-	43
4.	1983	1	1	12	3	4	-	4	-	3	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	32
5.	1984	1	-	5	2	5	-	4	1	3	-	1	1	1	-	-	-	-	-	1	-	-	-	-	-	25
6.	1985	-	-	12	2	3	1	4	-	1	-	2	1	-	1	-	1	-	-	-	-	-	-	-	-	28
7.	1986	-	-	6	2	3	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	12
8.	1987	-	-	10	2	2	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	17
9.	1988	-	-	5	4	2	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	6	3	23	
10.	1989	-	-	4	2	-	-	1	-	-	-	-	-	1	4	1	-	-	-	-	-	1	1	-	-	15
11.	1990	-	-	5	3	2	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	14
	Total	4	2	110	26	41	6	30	1	38	5	10	9	15	7	13	1	-	-	4	-	2	1	11	3	339
	G.Total	6		136		47		31		43		19		22		14		-		4		3		14		339

IJ = INDIAN JOURNALS
FJ = FOREIGN JOURNALS
APP = Architecture and Physical Planning Division
BM = Building Materials Division
BPPP = Building Processes Plant and Productivity Division
DCE = Development, Construction and Extension Division
EB = Effeciency of Buildings Division
FR = Fire Research Division

GE = Geotechnical Engineering Division
IOC = International Overseas Collaboration Division
MMG = Mathematical Modelling Group
RBE = Rural Buildings and Environment Division
SE = Structural Engineering Division

TABLE 4

Contribution in National and International Conferences/Seminars

Sl.	YEAR(S)	APP DIV		BM DIV		BPPP DIV		DCE DIV		EB DIV		FR DIV		GE DIV		IOC DIV		MMG DIV		RBE DIV		SE DIV		GENERAL		TOTAL
		NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	NAT	INT	
1.	1980	-	3	5	2	3	2	5	-	3	1	2	3	-	7	1	-	---	-	-	-	-	-	-	-	37
2.	1981	-	-	6	1	3	2	5	1	1	6	2	-	-	6	1	-	---	-	-	-	-	-	-	-	34
3.	1982	-	-	32	-	1	-	2	-	6	3	1	-	2	4	1	-	---	-	-	-	-	-	-	-	52
4.	1983	1	1	3	6	2	-	2	3	2	1	-	-	9	-	2	-	---	-	1	-	-	-	-	-	33
5.	1984-85	1	3	11	15	4	4	2	3	-	11	1	-	3	2	-	-	---	-	3	2	-	-	-	-	65
6.	1985-86	-	9	17	13	2	9	1	-	4	5	-	-	10	1	-	-	---	-	-	-	-	-	-	-	71
7.	1986-87	1	1	12	6	1	8	-	-	-	1	1	3	4	4	-	-	---	-	4	-	-	-	8	-	54
8.	1987-88	1	-	17	2	2	9	3	-	7	3	-	-	2	4	2	2	---	-	11	3	-	-	-	-	68
9.	1988-89	1	-	25	-	-	1	3	-	4	-	1	-	-	4	2	-	---	-	1	-	-	-	2	-	44
10.	1989-90	-	-	11	1	-	-	-	-	2	1	-	-	4	1	1	-	2	-	-	-	2	-	-	-	25
	TOTAL	5	17	139	46	18	35	23	7	29	32	8	6	34	33	10	2	2	-	20	5	2	-	10	-	483

IJ = INDIAN JOURNALS
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FR = Fire Research Division

GE = Geotechnical Engineering Division
IOC = International Overseas Collaboration Division
MMG = Mathematical Modelling Group
RBE = Rural Buildings and Environment Division
SE = Structural Engineering Division

TABLE 5

Year-wise Distribution of Papers Presented in National and International Conferences

Sl.No.	YEAR (s)	National Conferences	International Conferences	Total
1.	1980	19	18	37
2.	1981	18	16	34
3.	1982	45	7	52
4.	1983	22	11	33
5.	1984-85	25	40	65
6.	1985-86	34	37	71
7.	1986-87	31	23	54
8.	1987-88	45	23	68
9.	1988-89	39	5	44
10.	1989-90	22	3	25
	Total	300	183	483

Table 6

Total and Average Impact Factors

Number of Articles	Percentage of Articles	Impact Factor	Total
97	28.52	0.001	0.097
2	0.580	0.004	0.008
3	0.88	0.005	0.015
45	13.23	0.010	0.450
3	00.88	0.019	0.057
22	6.47	0.020	0.440
8	2.35	0.035	0.280
70	20.58	0.050	3.500
13	3.82	0.060	0.780
2	0.58	0.080	0.160
6	1.76	0.100	0.600
2	0.58	0.124	0.248
2	0.58	0.130	0.260
2	0.58	0.189	0.378
13	3.82	0.200	2.600
5	1.48	0.201	1.005
2	0.58	0.222	0.444
1	0.29	0.248	0.248
1	0.29	0.250	0.250
8	2.35	0.300	2.400
2	0.58	0.353	0.706
1	0.29	0.471	0.471
1	0.29	0.515	0.515
19	5.58	0.726	13.794
1	0.29	0.740	0.740
3	0.88	0.762	2.286
3	0.88	0.941	2.823
2	0.58	1.411	2.822
339 (340))	Total	38.371	100.00

Total impact factor of 340 article = 38.371
Average impact factor = 0.113

TABLE 7

Suggested Journals as Covered by Science Citation Index

Sl.NO.	DIVISION	NAME OF JOURNAL	COUNTRY OF ORIGIN	RANKING AS PER IMPACT FACTOR	IMPACT FACTOR	IMMEDIACY INDEX
1.	APP Division	Building and Environmental	UK	3233	0.217	0.000
2.	BM Division	Jl. of Amer. Cer. Society	USA	700927	1.323	0.262
3.	BM Division	Amer. Cer. Soc. Buil.	USA	1459	0.872	0.072
4.	Em Division	Jl. of Coating Technology	UK	1502	0.850	0.149
5.	BM Division	Wood Science Technology	UK	2042	0.581	0.167
6.	BM Division	Corrosion	UK	2165	0.533	0.056
7.	BM Division	Jl. of Chem. Tech. and Biotech	UK	2456	0.435	0.149
8.	BM Division	Cement Concrete Research	UK	2580	0.396	0.111
9.	BM Division	Chemistry and Industry	UK	2818	0.329	0.058
10.	BM Division	Ind. Jl. of Chemistry-A	INDIA	2864	0.314	0.21
11.	BM Division	Ind Jl. of Chemistry-B	INDIA	2879	0.281	0.054
12.	BM Division	Plastic and Rubber Processing and Application	UK	3082	0.255	0.021
13.	BM Division	Jl. of Oil and Chemical Association	UK	3103	0.250	0.040

that the work of the Indian scientific community is not being recognised by scientific community of the developed countries. It may be due to various factors. The importance of the work of a scientist may be revealed through the publication of Indian Science Citation Index. INSDOC, which is doing a pioneering work in the field of bibliometrics, is already engaged in the compilation of Indian Science Citation Index.

No doubt, engineering sciences are poor from the bibliometric citation point of view but the impact factor of the engineering sciences can be improved upon if the scientists of engineering disciplines carry out qualitative work in their respective fields and publish their work in foreign journals having high impact factor and immediacy index. It is generally seen that engineers do not cite authors whose works they use in their work.

The impact of research output of CBRI scientists on the scientific activity in the world can be improved if they publish their work in the standard journals with high impact factors and quote the works honestly and exhaustively which they use in writing their papers.

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REFERENCES

1. Central Building Research Institute:
   Annual Report, 1980-1990.
2. CSIR research output, 1987 :
   Bibliometric analysis of research papers. New Delhi, CSIR, 1987, 60 p.
3. CSIR research output, 1988. New Delhi, CSIR, 1988, 144 p.
4. CSIR research output, 1989, New Delhi, CSIR, 1989, 150 p.
5. GARFIELD E: Citation indexing - its theory and application in science, technology and humanities, New York, John Wiley, 1979, 374 p.
6. Elsevier handbook of qualitative studies of science and technology, ed, by A.F.J. Van Rann. Amsterdam, Elsevier, 1988.
7. Journal Citation Report, 1988. Philadelphia, ISI, 1989.

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PRESS CLIPPING SERVICE AT NATIONAL DOCUMENTATION CENTRE, NIHFW - A CASE STUDY

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The paper describes a press clipping service to the scientists and research workers of NIHFW provided by the National Documentation Centre of the Institute.

INTRODUCTION

Scientists need brief, accurate and current information for their research activities. Information looses its value with the passing of time. No doubt, among various information media available in libraries, none is more current than the daily press. It is an invaluable source of up-to-date information. The regular appearence of newspapers provide readers with a constant and reliable flow of local, regional, national and international information through articles, syndicated articles, statistical data, report on progress in scientific and technological research in various fields, new projects and schemes approved and implemented, etc.

In keeping with its policy to integrate health and family planning, the Govt. of India decided to merge together the National Institute of Family Planning which was set up in 1952 and the National Institute of Health Administration and Education which was set up in 1964. National Institute of Health and Family Welfare which represents the merger of the two institutes, was established in 1977 at New Delhi. In its new role, the institute was to bring about a broadbased approach in conducting its activities in the field of health and family welfare by better utilization of resources, experience and expertise of the two institutes.

The institute has the distinction of having a National Documentation Centre (NDC) and a library catering exclusively to the needs of planners, administrators, scholars, research workers and faculty members of the institute in the field of health and family welfare. The NDC of the institute also organizes training courses for the workers in regional and state health & family welfare training centres.

The NDC aims to collect, process and store pertinent information in the field of health, population and family welfare and disseminate the same to all institutions, agencies and individuals working in these areas. The NDC of the NIHFW compiles the "Press Clippings Index" monthly for distribution among the health & family welfare workers to achieve its aims.

OBJECTIVES

The purpose of the service is to improve the availability and accessibility of information on health, population and family welfare and to promote its exchange through systematic and regular collection, storage, retrieval and dissemination at national and regional levels. It would also facilitate in

a) Avoiding duplication of research;

b) Identification of areas where new research activities can be undertaken;

c) Updating the records of scientists and doctors as many a times advertisements on latest technology, equipment and medicines appear in newspapers; and

d) Appraising the scientists of the reviews of books and journals and the findings and achievements of different research institutions appearing in newspapers.

TECHNIQUES

Seven newspapers have been identified keeping in view the information needs of research

Table 1

Month-wise Break-up of Clippings from Newspapers

Name of Newspaper	Jan	Feb	Mar	Apr	May	June	Total	Percentage	Mean
Hindustan Times	53	51	36	64	80	60	344	18.5	57.3
Times of India	43	46	40	59	82	56	326	17.6	54.3
Indian Express	44	34	37	48	87	48	298	16.0	49.6
Economic Times	62	38	26	36	44	39	245	13.2	40.8
Hindu	40	42	28	46	46	37	239	12.9	39.8
Nav Bharat Times	45	37	28	38	39	39	226	12.2	37.6
Statesman	22	26	19	34	48	30	179	9.6	29.8
Total	309	274	214	325	426	309	1857	100.00	

Table 2

Subject-wise Break up of Clippings

Sl. No.	Subjects	No. of Clippings	Percentage
1.	Health Care	252	13.6
2.	Diseases	252	13.6
3.	Environmental Health	211	11.3
4.	Social Welfare	166	8.9
5.	Family Planning	153	8.3
6.	Sociology and Social Problems	120	6.5
7.	Health Economics	119	6.4
8.	Education & Training	108	5.8
9.	Drugs	97	5.2
10.	Population Composition and Dynamics	88	4.8
11.	Management Administration	71	3.8
12.	Biomedical Sciences	45	2.5
13.	Computers	33	1.8
14.	Miscellaneous	33	1.8
15.	Seminar & Workshops	27	1.5
16.	Personalia	23	1.2
17.	Library & Information Science	23	1.2
18.	Population Genetics	13	0.7
19.	Book Reviews	6	0.3
20.	Law	5	0.2
21.	Immunization	4	0.2
22.	Mother & Child Care	4	0.2
23.	Physical Exercise	2	0.1
24.	Product Information	2	0.1
	Total	1857	100.00

CENTRAL LIBRARY

scholars, MD students and scientists working in the institution. Out of these, six, namely Economics Times, Indian Express, Hindu, Hindustan Times, Times of India and Statesman are in English and Navbharat Times is in Hindi. The study is made from the clippings from newspapers collected during the period January 1992 to June 1992. The technical staff of the library goes through the newspapers and marks the relevant news items for clipping. In cases where the same news is published in more than one newspapers of the day, the best reported one is selected. After cutting out the item, it is pasted on a white sheet of paper and folded in such a way that it comes to a size appropriate to the size of a file. The name of the newspaper and the date is stamped on the sheet. The clippings are given appropriate subject headings and and are filed in respective clipping files in chronological order.

The references enlisted in press clipping index are categorized in six groups i.e. book reviews, editorials, letters to editor, news items, technical articles, advertisements and are classified according to the schedule designed by the National Documentation Centre. The entries are arranged on the basis of class numbers 01-23 followed by the subject headings. The class number and the clipping number constitute the location number for each item. A database of the news clippings is created using dBASE III+ or Foxplus package.

DISSEMINATION

The stored information is disseminated through a monthly bulletin entitled "Press Clipping Index". The photocopies of selected clippings can be obtained just by intimating clipping number appearing in the right most column of the citation.

DISCUSSION

1. In the period of January 1992 to Jun 1992 seven newspapers published 1857 items. The Statesman shows least percentage (9.6%) of productivity and Hindustan Times the highest percentage (18.5%) whereas that of Hindu, Navbharat Times and Economic Times is 12.9%, 12.2%, and 13.2% respectively.

2. Subject-wise break up (Table 2) shows contribution in all areas of health and family planning. The health care having the maximum contribution i.e., 13.6% in total publications followed by diseases (13.6%), environment health (11.3%), social welfare (8.9%) and family planning (8.3%).

CONCLUSION

The Press Clipping service in any special library plays a vital role in dissemination of current information on topics of current importance & research. It is an essential supplement to reference books. Scientists have come to recognize the importance of this source. Many projects start on the basis of the reports appearing in the newspapers. Though the use is limited yet any special library should introduce this service along with other services. It can be considered as an integral part of research organization.

REFERENCES

1. SULTAN A: Newspaper clippings - a current information tool. IASLIC Conference. 1985, 5, 189-194.
2. PRODHANI M A : Press clipping service and its importance in Agricultural Research Library. Ann Lib Sci Doc 1982, 29 (3), 135-137.
3. RAGHASIAH P : Press clipping file, its importance in the field of water resources. Ann Lib Sci Doc 1990, 37 (4), 117-120.

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LITERATURE ON LIBRARY AND INFORMATION SCIENCE MANPOWER PROBLEMS

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INTRODUCTION

Ever since the beginning of the modern library movement, the importance of the contribution of library personnel has been gaining strength steadily all over the world. In the modern times, the library and information science personnel have to acquire and cultivate knowledge and skills for communicating the sought information to a variety of users in an efficient and effective manner.

The importance of library and information science manpower in India has also risen considerably, particularly during the last four decades. There is now hardly any library which is not manned by professional manpower and supported by semi-professional and para-professional personnel. Realising the necessity of library and information manpower various authorities have suggested standard requirements in library personnel working in different types of libraries and information centres (1).

A number of library and information science schools are established in the country to provide adequate training to the staff. In addition to the formal education, they are also given the in-service training and sent for various continuing education programmes so that their professional knowledge is updated and they could provide better services to the user community. With the introduction of modern information technology in libraries, the role of library and information science personnel is undergoing a qualitative change. It is becoming a vital component in the overall resource management of library and information centres.

PURPOSE AND SCOPE

The paper analyses the literature on various aspects of library and information manpower published in Indian sources such as journals, books, anthologies, festschrifts, monographs, seminar papers, etc. On making the survey of literature it is revealed that no atterr t has so far been made to analyse the published literature on library manpower in India.

Citations have been collected for analysis on various aspects of the problems of library manpower working in various libraries and information centres. Attempt is made to analyse the contributions made by librarians, library and information science teachers, researchers, and others. The types of publications selected for the study are as follows:

Journals

About 25 library and information science journals published in English language are selected for scanning. One foreign journal published in English language is also scanned to dig out the contributions made by the Indian authors.

Bibliographical Databases

Four general bibliographies published on Indian library and information science literature [2-5] are thoroughly scanned to collect the necessary data on library manpower problems in India. All the four bibliographies, constituting the database, provide reasonably comprehensive coverage of the published literature.

Books

Contributions on library and information manpower in India published in some of the books edited for various purposes are also included in the study.

Table 1

Chronological Distribution

Year	*No. of Articles*	*Percentage*
1923	1	0.44
1958	1	0.44
1959	1	0.44
1960	1	0.44
1961	3	1.32
1962	-	-
1963	1	0.44
1964	2	0.88
1965	3	1.32
1966	3	1.32
1967	3	1.32
1968	20	8.81
1969	3	1.32
1970	1	0.44
1971	1	0.44
1972	3	1.32
1973	1	0.44
1974	-	-
1975	7	3.08
1976	5	2.20
1977	2	0.88
1978	6	2.64
1979	1	0.44
1980	4	1.76
1981	10	4.40
1982	6	2.64
1983	7	3.08
1984	23	10.13
1985	21	9.25
1986	11	4.84
1987	24	10.57
1988	24	10.57
1989	28	12.33
Total	227	100.00

Conference / Seminar Papers

Papers presented on the theme of library and information science manpower at some of the seminars and conferences (if made available in published or mimeographed form) are also covered for the analysis.

Every effort has been made to scan all the possible sources upto the year 1989. There may still exist a possibility of some of the contributions eluding this investigator for one or the other reason. Hence comprehensiveness is not claimed.

BASIS OF ANALYSIS

During the scanning of all of the sources the citations were noted on cards and subsequently grouped under the following conceptual/subject headings which formed the parameters of the study.

a) Library staff (general)
b) Academic status
c) Job performance
d) Job satisfaction
e) Job description
f) Job evaluation
g) Professional positions
h) Qualifications
i) Salary scales
j) Selection
k) Professional ethics
l) In-service training
m) Service conditions and staff formula

All the contributions included in the present study on the above mentioned parameters are analysed on the basis of the following factors:

a) Chronological scatter
b) Conceptual/Subject scatter
c) Article scatter
d) Authorship pattern

Chronological Scatter

Citations of a total of 227 contributions were collected upto the end of 1989 from the identified sources. A chronological distribution of these contributions is given in Table 1.

The range of contributions, as presented in Table 1 is between 1 and 28. One article on one or the other problem of library and information science manpower was reported in the literature in each of 1923, 1958-60, 1963, 1970, 1971, 1973, and 1979; while 28 articles were published in 1989 only. It may, further, be pointed out that no article was published on the subject in the years 1962 and 1974.

The average number of articles for all these years, considering each reported year as one unit of time, works out to be 6.87; but by excluding the two years for which there was no contribution, the average goes to 7.32. The contributions in the years 1968, 1981, and 1984 to 1989 were higher than the average and for 1975 and 1983, it was just on the average line while for the remaining years it was much below the annual average.

There was an increase in the publications on library and information workforce during 1980s with a couple of exceptions. For a still better view, the data is presented in Table 2. The table reveals that the literature published on library and information science manpower during 1960s was higher than that published during 1970s. However, literature published during the 1980s was also higher than that published upto the end of 1970s. Even the contributions made in the second half of the 1980s were more than double the contributions in the first half. This indicates a trend for continuous rise in the contributions in this important area in the years to come. This increase may, however, be attributed to the growth in the number of library and information science schools, increase in the strength of the faculty, rise in the number of working librarians, documentation officers, information science workers, growth in the number of library and information science periodicals, etc.

Table 3 reveals that 20 library and information science schools of university level were set up during the 1960s and 14 were set up during the 1970s which means about half of the training programmes were started within these two decades. About 15 of the library and information science journals were also started during the same period, which again comes to about 50% of the total periodicals. But on the other hand, only 29% of literature on different parameters of library and information science personnel was published in various sources during 1960s and 1970s. On the contrary, 23 library and information science departments were set up during the 1980s which

Table 2

Cumulative Chronological Distribution

Years in 5's	*No. of Articles*	*10-Year Cumulations*	*5-Year Percentage*	*10-Year Percentage*
Up to 1959	3	3	1.32	1.32
1960-64	7	-	3.08	-
1965-69	32	39	14.09	17.18
1970-74	6	-	2.64	-
1975-79	21	27	9.25	11.97
1980-84	50	-	22.02	-
1985-89	108	158	47.57	69.60
Total	227	227	100.00	100.00

Table 3

Growth of Literature Compared with the Growth of Schools and Journals

Period	*No. of Articles*	*No. of University Schools*	*Cumulated Number*	*No. of Journals*	*Cumulated Number*
Up to 1959	3	13	13	5	5
1960-64	7	9	22	5	10
1965-69	32	11	33	3	13
1970-74	6	9	42	4	17
1975-79	21	5	47	3	20
1980-84	50	10	57	6	26
1985-89	108	13	70	3	29

is about one-third of the total university schools. During the same period, about 9 library and information science journals were also started, which is also about one-third of the total periodical publications. But the number of contributions made on the problems of study is one-third of the total, it is rather about 69% which is more than two-third of the total contributions being analysed. Thus there seems to be direct correlation between the growth of literature and the growth of library and information science schools and journals.

SUBJECT SCATTER

All the contributions were divided into thirteen subject headings, and all the citations were distributed among them to have an overiew of the articles (Table 4).

It is clear that more than half of the contributions were made by the professionals working in all types of libraries on library personnel in general. It is followed by the contributions on 'Academic status' and 'Salary scales' which have been quite hot issues of formal and informal discussions at the organizational platforms or otherwise. The divisions like 'Job description', 'Job evaluation', and 'Job satisfaction' attracted very few contributions from the professionals. Similarly, 'Service conditions' and 'Staff formula' did not attract much attention of the library and information workers in India.

A combined presentation of chronological and subject distributions is given in Table 5. It explains that the decade 1980-89 was most productive in the area of library and information science manpower in India. The data presented in the above table does not reveal any consistent growth of literature. A decline in literature after the period 1965-69 and a further rise again during the first half of the 1980s was observed.

The sudden increase in literature can possibly be attributed to the cumulative impact of the establishment of about 70 library and information science schools of the university level and about 25 live library and information science journals and a large number of librarians, teachers, and other information science workers in the country.

ARTICLE SCATTER

The contributions included for analysis have not been published only in the professional journals but also in other sources such as books, edited books, conference proceedings, etc. Journal-wise distribution of articles is presented in Table 6.

A total of 144 contributions were taken from 28 professional periodicals one of which is published from abroad. This shows that about 63.43% literature is reported in journals, which is the most important media for professional communication. The ILA Bulletin of the Indian Library Association has taken the lead by publishing 34 articles on library and information science manpower problems which is about 23.6% of total periodical literature. Herald of Library Science, another important journal, has published 16 articles on the subject under study closely followed by 15 articles published in one of the oldest periodical, Indian Librarian (now ceased for almost a decade).

The professional journals published 37 articles upto 1970, 29 articles were published during the decade 1971-80 and for the nine years i.e. 1981-89 as many as 78 articles were published on library and information science personnel.

AUTHORSHIP PATTERN

A large amount of literature is observed to be single author contributions. Authorship during the period is presented in Table 7.

Thus it is clear from the table that about 77.5% contributions were made by single authors which shows that joint research is not popular in library and information science field, and the authors prefer to write independently.

Foreign Authors

It may also be pointed out that out of a total of 227 contributions only 9 articles were published by foreign authors in Indian sources during the 1981-89 block of years. During the 1970s, 1960s, and backwards, no foreign author was seen to publish any article in Indian sources on any topic under study.

Table 4

Subject Scatter

Sl. No.	*Subject Divisions*	*No. of Articles*	*%of Total*	*Ranking*
1.	Library Staff (general)	133	58.59	1
2.	Academic status	19	8.37	2
3.	Job performance	8	3.56	6
4.	Job satisfaction	6	2.64	7
5.	Job description	3	1.32	8
6.	Job evaluation	1	0.44	10
7.	Professional positions	15	6.60	4
8.	Qualification	8	3.52	6
9.	Salary scales	16	7.04	3
10.	Selection	3	1.32	8
11.	Professional ethics	11	4.84	5
12.	In-service training	2	0.88	9
13.	Service conditions and staff formula	2	0.88	9
	Total	227	100.00	

Table 5

Chronological and Subject Distribution

Subject Divisions	*Upto 1959*	*1960-1964*	*1965-1969*	*1970-1974*	*1975-1979*	*1980-1984*	*1985-1989*	*Total*
Library staff	1	5	22	2	11	23	69	133
Academic status	-	-	2	2	5	3	7	19
Job performance	-	-	-	-	-	3	5	8
Job satisfaction	-	-	-	-	-	2	4	6
Job description	-	-	2	-	-	-	1	3
Job evaluation	-	-	-	-	-	1	-	1
Professional positions	-	-	-	-	-	8	7	15
Qualifications	-	-	2	-	2	-	4	8
Selection	-	-	1	-	1	1	-	3
Salary scales	1	2	3	1	1	1	7	16
Professional ethics	-	-	-	-	-	8	3	11
In-service training	-	-	-	-	-	1	1	2
Service conditions and staff formula	1	-	-	-	1	-	-	2
Total	3	7	32	5	21	51	108	227

Table 6

Article Scatter

Sl. No.	*Name of Journal*	*Number of Articles*	*Ranking*
1.	Academic Librarian	1	11
2.	ALIS Bulletin (ceased)	2	10
3.	Annals of Library Literature	1	11
4.	Annals of Library Science and Documentation	8	6
5.	CLIS Observer	1	11
6.	DRTC Seminar (Annual)	7	7
7.	Herald of Library Science	16	2
8.	IASLIC Bulletin	9	5
9.	ILA Bulletin	34	1
10.	Indian Journal of Information, Library and Society	1	11
11.	Indian Librarian (ceased)	15	3
12.	International Information, Communication and Education (INICAE)	1	11
13.	International Library Movement	7	7
14.	International Librarian (ceased)	4	8
15.	Journal of Library and Information Science	2	10
16.	Libra	4	8
17.	Library & Librarian (ceased)	1	11
18.	Library Herald	11	4
19.	Library Progress (International)	1	11
20.	Library Science with a slant to Documentation & Information Studies	3	9
21.	Library Today	1	11
22.	Lucknow Librarian	8	6
23.	National Librarian (ceased)	1	11
24.	RILISAR Bulletin	1	11
25.	Science Today	1	11
26.	University News	1	11
27.	WBCLA Conference	1	11
FOREIGN			
28.	Education forInformation Science	1	11
	Total	144	

Indian Authors in Foreign Sources

Only one contribution was observed to be made by an Indian author in a foreign journal during the period of study, which leads to the interpretation that the Indian library and information workforce mostly prefer to publish in the native sources.

CONTRIBUTIONS IN BOOK FORM

The most productive decade was 1980-1989. This attracted the attention of authors to contribute on the general problems of library personnel and their academic status. A number of books on the same theme and on library manpower development were published during the period, which might have been the result of a national seminar held on the theme at Nagpur University in 1985.

SEMINARS

A number of seminars have been organised in India on library and information science manpower during the last twenty five years or so. The Uttar Pradesh Library Association organised a seminar on library personnel and their problems at Roorkee in 1967.

The Documentation Research and Training Centre, Bangalore organised a seminar in this connection and in commemoration with its Silver Jubilee, in 1987. A section on 'Professional Position' was included in a seminar organised in Delhi in 1984.

A section on 'Professional Ethics' was included in the IASLIC seminar held at Hyderabad in November 1984.

It is suggested that in the interest of the profession and the professionals at large, the papers and the proceedings of such seminars/conferences, etc. are published for a wider circulation.

DISSERTATIONS AND THESES

It may be pointed out that a number of studies on the subject leading to theses and dissertations of the Ph D., M. Phil. and MLI Sc. degrees in various universities were also taken up.

CONCLUSIONS

This survey reveals that literature on library and information science manpower started proliferating since the beginning of the 1980s only. Availability of more facilities, more opportunities, maturity of the profession and increase in the workforce might be the reasons for there being more contributions on the subject in the literature.

Table 7

Pattern of Authorship

Periods Authors	*Upto 1959*	*1960-1964*	*1965-1969*	*1970-1974*	*1975-1979*	*1980-1984*	*1985-1989*	*Total*
Single	1	5	29	6	16	41	78	176
Two	-	1	1	-	1	6	19	28
Three and More	-	1	-	-	2	2	7	12
Titles	-	-	1	-	1	1	2	5
Corporate	2	-	1	-	1	-	2	6
Total	3	7	32	6	21	50	108	227

SUGGESTIONS

a) In view of the changing information environment all around, the library personnel in India also need to change and feel the pulse of the time. They need to train themselves in the use of new information technology.

b) The professional associations such as the ILA, IASLIC, the Society for Information Science, AGLIS, etc., should pay concentrated attention to solve the vexed problems of the library personnel.

c) The organisations like the University Grants Commission should take some concrete steps to restructure the staffing pattern in different types of libraries taking in view the changing situations and revise the staff formula accepted by it long ago.

d) The salary scales and recognition granted to the library and information professionals is a landmark in itself. It is now the duty of all the professionals to prove worthy of this recognition, and strive to achieve academic status and social image as well.

e) The survey of the LIS manpower needs conducted by the IASLIC and the Burdwan University on behalf of the NISSAT has been a maiden effort with only a limited response and a partial success. It is, therefore, suggested that such surveys should be conducted periodically with a large sample of respondents. Also, a roaster of library and information science personnel with regular updates may be established at a suitable national organization.

f) It also calls for updating the training courses in the LIS schools in the country so that necessary resources and facilities be provided for the increasingly technology-driven information systems of the future.

REFERENCES

1. KUMAR P S G : Library and information manpower development - papers and proceedings of the Nagpur seminar, New Delhi, Indus Publishing Company, 1988.
2. PRASHER R G : Indian library literature - an annotated bibliography New Delhi, Today & Tomorrow's Publishers,
3. SEWA SINGH : Indian library literature - an annotated bibliographic guide, 1971-80, New Delhi, Today & Tomorrow's publishers, 1986.
4. SEWA SINGH : Indian library literature, 1981-85 - an annotated bibliographic guide, New Delhi, Ess Ess Publications, 1988.
5. SEWA SINGH : Indian library and information science literature, 1986-89, New Delhi. Ess Ess Publications, 1991.

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PATTERN OF INFORMATION USE BY INDIAN ENTOMOLOGISTS

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Discusses the pattern of information use by scientists in the field of entomology through citation analysis of Indian Journal of Entomology for the year 1989. Identifies the various sources of information and their country of origin. A ranked list of Indian entomology journals and another ranked list of journals, irrespective of their country of origin, in the field of entomology from the view point of use by the Indian entomologists are given.

INTRODUCTION

The study of pattern of bibliographic references reveals the importance of various sources in the particular field [1] which indirectly helps in procuring reference materials according to the study habit of the scientists. This is necessary to make the procurement of sources in the library more cost effective [2]. Rating of journals through citation analysis in various fields of science have already been reported [3-13]. Since there was no such study reported earlier in the field of entomology, the present study was undertaken to prepare a ranked list of entomology journals from the viewpoint of use of references by the Indian entomologists.

MATERIALS AND METHODS

Indian Journal of Entomology is taken as source of this study as this journal is outstanding in its coverage and is intended mainly to publish original research papers exclusively in the field of entomology. The citation counting of Indian Journal of Entomology, Vol.54, 1989 yielded a total of 981 citations in 105 articles and short notes as shown in Table 1 and Fig.1.

Out of the total of 981 citations 407 are from Indian sources which form 41.1% of the total citation count and are distributed as shown in Table 2 and Fig. 2.

India having the highest number of sources is followed by USA and UK. A total of 214 (23.05%) citations were from US sources; 9.5% citations were from British sources and rest 23.6% were from other countries.

It is observed that major sources of information were the journals which constitute 73.9% of the

Table 1

Distribution of Sources of Citations

Sl. No.	Item	Total Citations	Percentage out of total citations
1.	Journals	718	73.2%
2.	Books/monographs	78	7.95%
3.	Theses	34	3.46%
4.	Conf. Proceedings	68	6.93%
5.	Others	83	8.46%
	Total	981	100.0%

Fig.1 Distribution of Forms of Citations

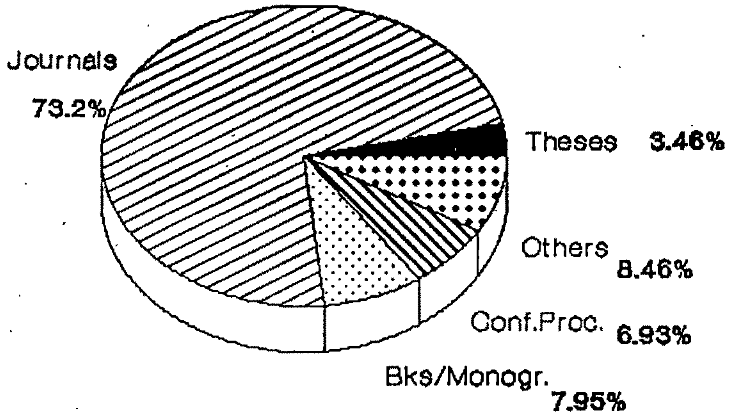

Fig.2 Distribution of Sources of Indian Citations

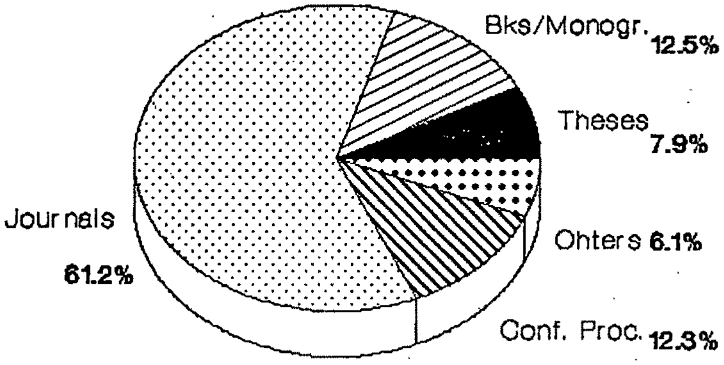

Table 2

Distribution of Sources of Indian Citations

Sl. No.	Item	Total Citations	Percentage out of Total Citation
1.	Journals	249	61.2%
2.	Books/monographs	51	12.5%
3.	Theses	32	7.9%
4.	Conf. proceedings	50	12.3%
5.	Others	25	6.1%
	Total	407	100.0%

Table 3

Citation-wise Distribution of Percentage of Journals

Percentage of Journals (out of 214 titles)	Number of citations received
7.91%	7 and above
3.74%	6
2.80%	5
3.27%	4
6.08%	3
14.96%	2
61.24%	1

Fig. 3 - Obsolscence of Entomology literature

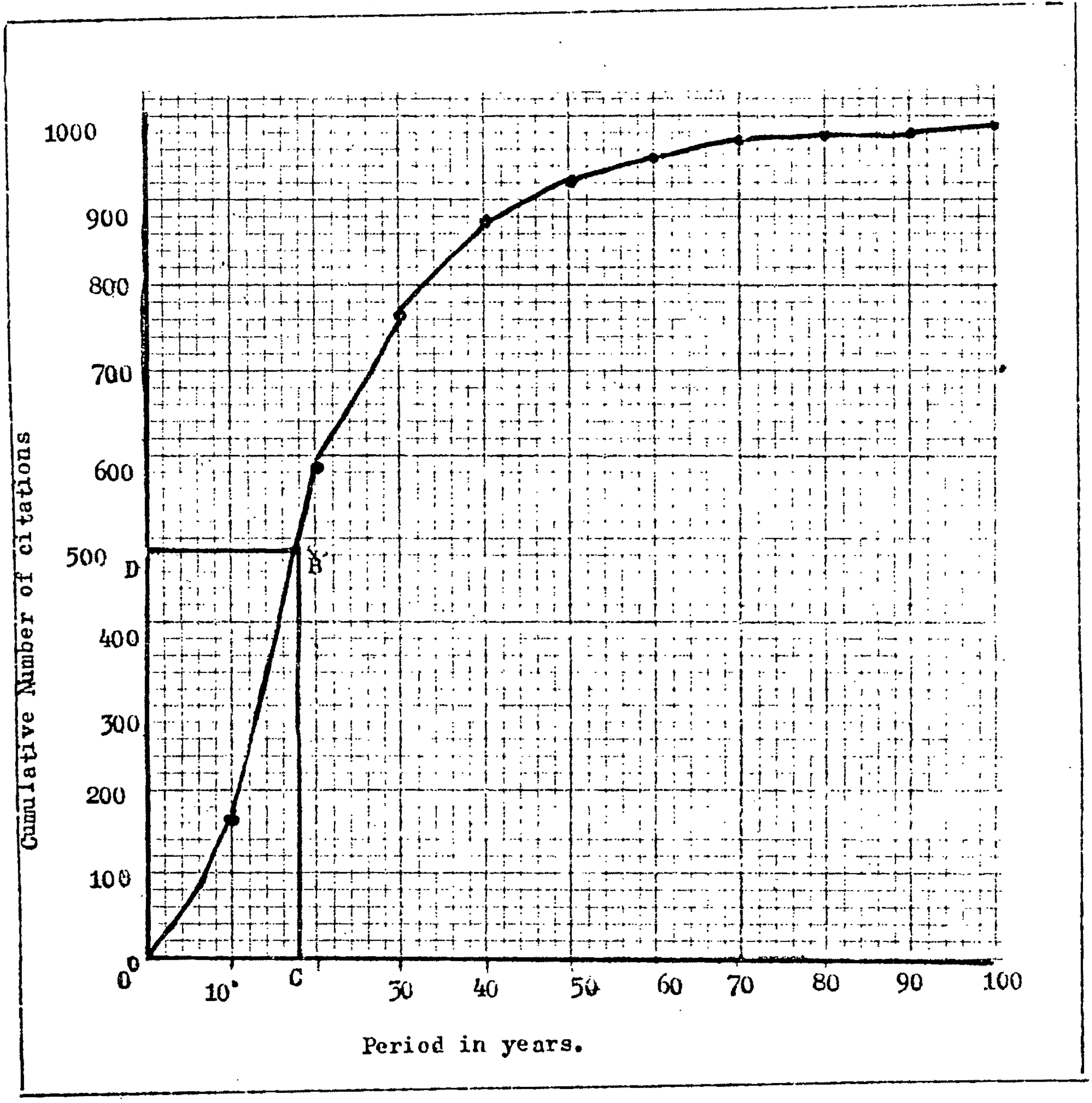

Table 4

Ranked List of Indian Entomology Journals

Sl. No.	Title of Journal	Total Citations	% out of 981 total ref.	% out of 407 Indian ref.	% out of 718 ref. from journals
1.	Indian J Entomol	105	10.73	25.79	14.62
2.	Pesticides	36	3.66	8.84	5.01
3.	Indian J Agric Sci	28	2.85	6.87	3.90
4.	Madras Agric J	19	1.95	4.66	2.65
5.	Indian J Nematol	17	1.73	4.17	2.37
6.	Bull Grain Technol	14	1.45	3.43	1.95
7.	Entomon	11	1.12	2.70	1.53
8.	J entomol Res	7	0.71	1.71	0.97
9.	Indian J Pl Protection	6	0.61	1.47	0.84
10.	Sci Culture	6	0.61	1.47	0.84
11.	Indian J Ecol	5	0.50	1.22	0.70
12.	Indian J exp Biol	5	0.50	1.22	0.70
13.	J Fd Sci & Technol	4	0.40	0.98	0.56
14.	Curr Sci	3	0.30	0.73	0.42
15.	Indian Farming	3	0.30	0.73	0.42
16.	Indian J Hort	3	0.30	0.73	0.42
17.	Indian J Zool	3	0.30	0.73	0.42
18.	Indian Oil Seed J	3	0.30	0.73	0.42
19.	J Maharashtra agric University	3	0.30	0.73	0.42
20.	J Res, Haryana Agri University	3	0.30	0.73	0.42
21.	Pestology	3	0.30	0.73	0.42

Table 5

Ranked List of Entomology Journals Both from India and Abroad

Sl. No.	Title of Journals	Total Citations	% Out of 981 total ref.	% Out of 407 Indian ref.	% Out of 718 ref. from journals
1.	Indian J Entomol	105	10.70	25.80	14.62
2.	J Economic Entomol	43	4.38	11.11	5.99
3.	Pesticides	36	3.66	8.84	5.01
4.	Indian J Agric Sci	28	2.85	6.87	3.90
5.	Madras Agric J	19	1.93	4.66	2.65
6.	Bull Entomol Res	19	1.93	4.66	2.65
7.	Indian J Nematol	17	1.73	4.17	2.37
8.	J Agric Fd Chem	15	1.52	3.68	2.09
9.	Bull Grain Technol	14	1.42	3.43	1.95
10.	J Insect Physiol	14	1.42	3.43	1.95
11.	J Stored Prod Res	14	1.42	3.43	1.95
12.	Entomon	11	1.12	2.70	1.53
13.	Ann Entomol Soc Am	11	1.12	2.70	1.53
14.	Envir Entomol	10	1.01	2.45	1.39
15.	Ann Rev Entomol	8	0.81	1.96	1.11
16.	J Entomol Res	7	0.71	1.71	0.97
17.	Science	7	0.71	1.71	0.97
18.	Indian J Pl Protection	6	0.61	1.47	0.84
19.	Sci Culture	6	0.61	1.47	0.84
20.	Rev of Entomol	6	0.61	1.47	0.84
21.	Entomologist's Newslett	6	0.61	1.47	0.84
22.	Canadian Entomol	6	0.61	1.47	0.84
23.	Entomol Exp Appl	6	0.61	1.47	0.84
24.	Tr R Entomol Soc	6	0.61	1.47	0.84
25.	Ecology	6	0.61	1.47	0.84
26.	Indian J Ecol	5	0.50	1.22	0.70
27.	Indian J Exptl Biol	5	0.50	1.22	0.70
28.	FAO Pl Protection Bull	5	0.50	1.22	0.70
29.	PANS	5	0.50	1.22	0.70
30.	Proc R Entomol Soc	5	0.50	1.22	0.70
31.	Sorghum Newslett	5	0.50	1.22	0.70
32.	J Fd Sci Technol	4	0.40	0.98	0.56
33.	Appl Entomol Zool	4	0.40	0.98	0.56
34.	Nature	4	0.40	0.98	0.56
35.	Pestic Sci	4	0.40	0.98	0.56
36.	J Ass Offi Agric Chemists	4	0.40	0.98	0.56
37.	Physiol Zool	4	0.40	0.98	0.56
38.	Proc Nat Acad Sci	4	0.40	0.98	0.56
39.	Curr Sci	3	0.30	0.73	0.42
40.	Indian Farming	3	0.30	0.73	0.42
41.	Indian J Hort	3	0.30	0.73	0.42
42.	Indian J Zool	3	0.30	0.73	0.420
43.	Indian Oil Seed J	3	0.30	0.73	0.42
44.	J Maharashtra Agric Univ	3	0.30	0.73	0.42
45.	J Res, Haryana Agric Univ	3	0.30	0.73	0.43

46.	Pestology	3	0.30	0.73	0.42
47.	Canadian J Zool	3	0.30	0.73	0.42
48.	J agric Res, China	3	0.30	0.73	0.42
49.	Z Angew Entomol	3	0.30	0.73	0.42
50.	Int Pest Control	3	0.30	0.73	0.42
51.	J Biol Chem	3	0.30	0.73	0.42
52.	Qd J Agric, Anim Sci	2	0.20	0.50	0.29
53.	Radiat Res	2	0.20	0.50	0.29
54.	Bull Soc Entomol	2	0.20	0.50	0.29
55.	Entomophaga	2	0.20	0.50	0.29
56.	Agric Res J Kerala	2	0.20	0.50	0.29
57.	Andhra agric J	2	0.20	0.50	0.29
58.	Bull of Entomol	2	0.20	0.50	0.29
59.	GAU Res J	2	0.20	0.50	0.29
60.	Geobios	2	0.20	0.50	0.29
61.	Indian J Sericulture	2	0.20	0.50	0.29
62.	Oriental Insect	2	0.20	0.50	0.29
63.	Pulse Crop Newslett	2	0.20	0.50	0.29
64.	South Indian Hort	2	0.20	0.50	0.29
65.	Pyrethrum Post	2	0.20	0.50	0.29
66.	Malayasian Nature J	2	0.20	0.50	0.29
67.	Z Naturfsch	2	0.20	0.50	0.29
68.	J agric Res, Pakistan	2	0.20	0.50	0.29
69.	Intt Rice Res Newslett	2	0.20	0.50	0.29
70.	Analyst	2	0.20	0.50	0.29
71.	Ann appl Biol	2	0.20	0.50	0.29
72.	J Animal Ecol	2	0.20	0.50	0.29
73.	J exp Biol, UK	2	0.20	0.50	0.29
74.	Tr entomol Soc	2	0.20	0.50	0.29
75.	Biol Bull	2	0.20	0.50	0.29
76.	Bull entomol Soc Am	2	0.20	0.50	0.29
77.	Hilgardia	2	0.20	0.50	0.29
78.	J Off analyt Chemist	2	0.20	0.50	0.29
79.	J NY entomol Soc	2	0.20	0.50	0.29
80.	Medit Pl Protection Organ Bull	2	0.20	0.50	0.29
81.	Pest Control	2	0.20	0.50	0.29
82.	Scientific American	2	0.20	0.50	0.29
83.	Soil Sci	2	0.20	0.50	0.29
	Rest 131 titles out of 214 titles	1	0.10	0.24	0.14

Table 6

Rankwise Distribution of Journal Citations

Rank No.	No. of Citations	No. of Journals	Cumulative No. Journals	Cumulative No. Citations
1	105	1	1	105
2	43	1	2	148
3	36	1	3	184
4	28	1	4	212
5	19	2	6	250
6	17	1	7	267
7	15	1	8	282
8	14	3	11	324
9	11	2	13	346
10	10	1	14	356
11	8	1	15	364
12	7	2	17	378
13	6	8	25	426
14	5	6	31	456
15	4	7	38	484
16	3	13	51	523
17	2	32	83	587
18	1	131	214	718

Table 7

Chronological Distribution of Cited Articles

Age of Citations (Years)	No. of Citations	Cumulative No. of Citations
0 - 10	169	169
10 - 20	379	584
20 - 30	225	773
30 - 40	105	878
40 - 50	43	921
50 - 60	34	955
60 - 70	16	971
70 - 80	5	976
80 - 90	3	979
90 - 100	2	981

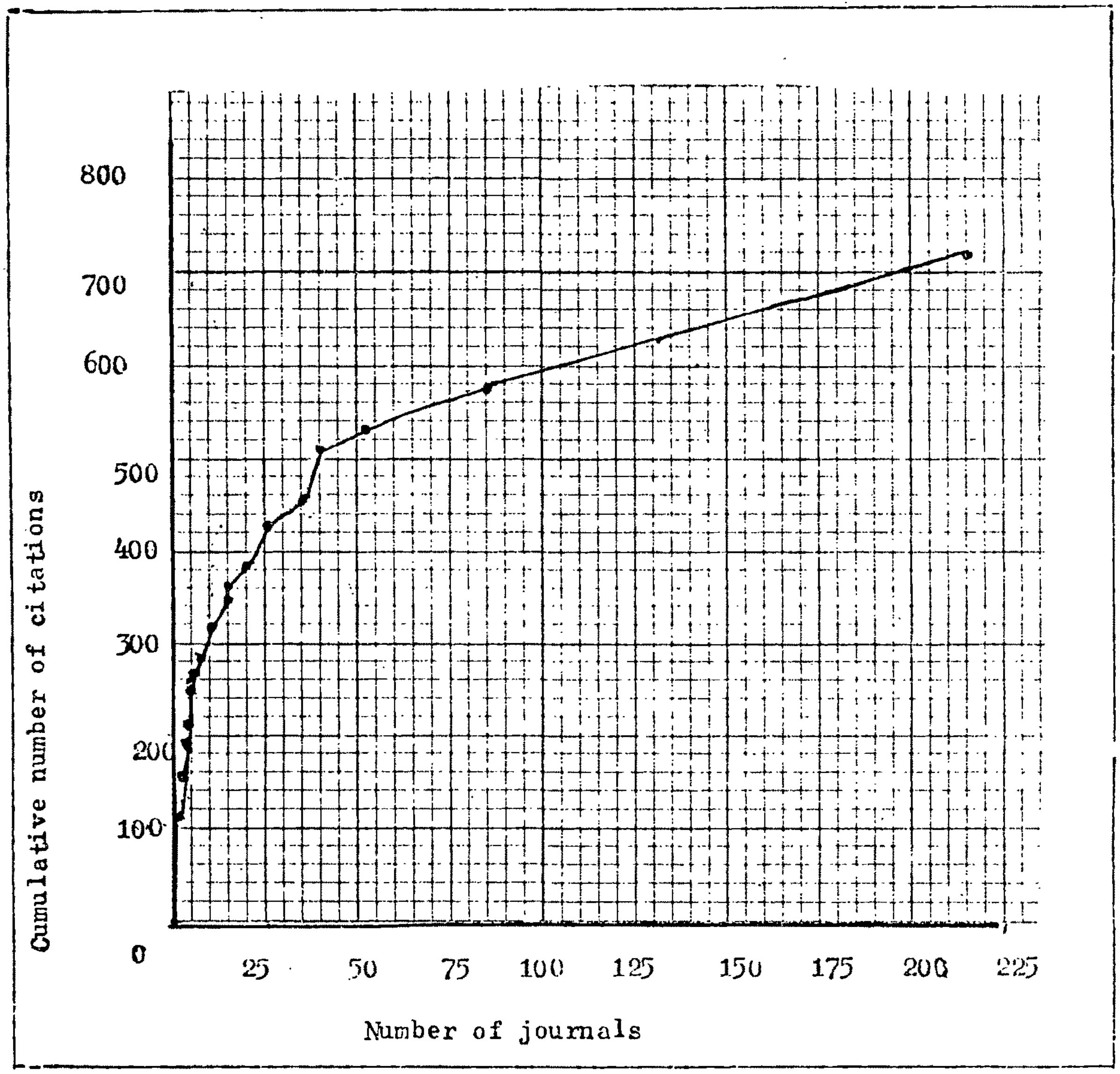

Fig. 4 Bradford Law of D distribution

total citations. These 718 citations are to only 214 journal titles. Out of these 214 titles 58 (27.1%) are of Indian origin.

On further analysis, it is also seen that only 7.9% of the titles (out of 214 titles) were cited more than seven times out of which 3.7% were Indian, 3.7% were US and 0.5% were British titles. Percentage of journals arranged according to number of citations they received can be seen in Table 3.

A rank list of Indian entomology journals and another rank list of entomology journals irrespective of their country of origin are given in Table 4 and Table 5 respectively. The journals are arranged according to the number of citations received. Indian Journal of Entomology with 105 citations topped both the rank lists whereas Journal of Economic Entomology with 43 citations occupied second place in the second list. Pesticides with 36 citations occupied second place in the first list and third place in the second list. A total of 21 Indian journals are listed in Table 4 according to their rank. Table 5 shows ranked list of 83 journals of both Indian and foreign origin which received three or more citations.

OBSOLESCENCE OF LITERATURE

The Chronological distribution of the cited articles in the field of entomology based on the present study is shown in table 7. The rate of obsolescence of literature based on citation analysis indicates that books as old as 99 years and journals upto 90 years old were used by the Indian entomologists. More than 50% of citations were to publications published within 0-20 years and 91% of the citations were to those published within 0-40 years. Rest 9% citations were distributed to 41-100 years old publications. The data was plotted on a plain graph paper taking age of citations on the X axis and the cumulative number of citations on the Y axis (Fig.3). To find the half life, a line parallel to Y axis was drawn from the point D to meet the curve at B (D represents half of the total citations). Then, from the point B another line was drawn to meet the X axis at point C. OC represents the half life of literature which is 18-19 years.

Table 6 shows the rankwise distribution of number of journals along with the cumulative number of citations. The data was plotted on a plain graph paper with cumulative number of journals on the X axis and cumulative number of citations on the Y axis to test the scattering of information in this field of science. The graph so obtained was hyperbolic (Fig.4) and is in accordance with the Bradford's Law of scattering.

CONCLUSION

Indian Journal of Entomology is the highly cited journal in the field followed by the Journal of Economic Entomology with 105 and 43 citations respectively. Major portion of the citations are from journals (73.9%) and a total of 41.7% citations are from Indian sources followed by 23.1% from USA. Though the age of citations are ranging between 1891 to 1989, i.e., within a period of 100 years yet 91.2% are within the time space of 0-40 years. The half life of the entomology literature is calculated as 18-19 years. The scattering of the journal literature is in accordance with the Bradford's Law of scattering.

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REFERENCES

1. PRICE DE SOLLA : Network of scientific papers. Science. 1965, 149, 510-15.
2. BAROOAH P K and BHUYAN B R : An approach for selection of journals in the libraries of R&D institutions. (submitted to Ann Lib Sci & Doc for publication).
3. NIJAGUNNAPPA R and NIJAGUNNAPPA P : Core journals used by Indian geological scientists (1978-82). J Geol Soc India. 1985, 26, 101-108.
4. OMOTOSO R O: Price trends in geophysics journals 1975-1985. IASLIC Bull. 1988, 33 (1), 1-5.
5. PRAVATHAMMA N, GUNJAL S R and NIJAGUNNAPPA R: Core journals in earth sciences - a comparative study. J Geol Soc

India. 1991, 38 (4), 387-95.

6. SENGUPTA I N: Growth of the biochemical literature. Nature. 1973, 244 (5411), 75-76.
7. SENGUPTA I N : Choosing pharmacology periodicals - study of growth of literature in the field. Ann Lib Sci Doc. 1974, 21, 1-21.
8. SENGUPTA I N : Choosing of microbiology journals - a study of growth of literature in the field. Ann Lib Sci Doc. 1974, 21, 95-111.
9. SENGUPTA I N : A weightage formula to re-rank periodicals in the field of microbiology. Scientometrics. 1989, 17 (3-4), 289-300.
10. SENGUPTA I N: Bibliometrics and identification of core periodicals. Herald of Lib Sci. 1990, 29 (3-4), 226-247.
11. SINGH J P: Rising trend in subscription rates of military science journals. ILA Bull. 1990, 26 (2), 1990, 95-106.
12. SINGH M: Studies of chemical literature and change in the ranking of periodicals by citation analysis of data for 1967-76. Ann Lib Sci Doc. 1978, 25, 55-61.
13. SINGH R S: Ranking periodicals in chemistry from the point of view of Indian scientist. Ann Lib Sci Doc. 1974, 21, 55-67.

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AN APPROACH FOR SELECTION OF JOURNALS IN LIBRARIES OF R&D INSTITUTIONS

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Considering the conventional approach for selection of journals based on ranking through bibliographical countings not entirely suitable for libraries of R&D organizations, a use-based selection process which seems to be more systematic and cost efffective for such organizations has been reported.

INTRODUCTION

S&T journals are indispensible resource for a library of any R&D organisation as they play a pivotal role in the communication channel and as such most of the libraries of such organisations spend the bulk of the budget for purchase of journals. However, during the recent years many of these libraries are facing a financial crunch as the cost of the journals is increasing every year disproportionate to the library budget (1-7). Further, the libraries of the organizations embarking on new R&D programmes are required to subscribe new journals in specific areas. In such a situation, the libraries need to review their acquisition policy regularly and subscribe the journals having more relevance to the activities of the organizations. The usual way to know the relative importance of a journal is to see its rank among the titles in a certain discipline of science based on citation studies. A large number of such studies on journals of various disciplines have been done in India (8-18). Rating of journals through citation counts, though undoubtly a rational and logistic way, has some limitations in the selection of journals for the R&D organisations. It is because, the R&D organisations mostly have to perform highly applied research in micro areas which are often poorly cited in conventional journals due to various reasons. So the selection of journals solely based on citation studies may not always satisfy the information needs of the R&D community effectively. Further, the utility of journals ranking high in bibliographic citation may wane because of the shift of R&D work and emergence of new journals.

With this view, a different approach is followed for selection of foreign journals for the library of the Regional Research Laboratory, Jorhat. The laboratory is primarily engaged in multidisciplinary applied research. Like any other R&D organisation in India, the S&T personnel of the laboratory heavily depends on foreign S&T journals for information needs. The annual inflation in price of the journals over the years has been severely affecting the acquisition programme of the library. The library on an average has to delete three titles every year to contain the mounting expenditure. Currently the library has arrived at an alarming situation as the cost of the pound sterling, US dollar and DM, the commonly used foreign currencies have registered a rise of about 27%, 41% and 16% respectively. In view of the soaring rates of subscription of journals and conversion rates of exchange vis-a-vis stringent budgetary constraints, the library has to review its journal acquisition policy thoroughly and size up the subscription list of journals to match the library budget. For this purpose a utility oriented approach for selection of journals in the library as described below was applied.

MATERIALS AND METHODS

A total of three hundred and one titles were subscribed by the library in the year 1991. Out of which 109 titles were Indian and 15 titles both of Indian and foreign origin were received free of cost. The rest 177 titles were subscribed from foreign countries. The Indian titles were excluded from the study as all the Indian Journals under subscription were decided to be continued. Out of the 177 titles of foreign origin, 11 titles which were abstracting or review publications were also excluded from the study as they were considered

Table 1

Rank List of Organic Chemistry Journals and its Comparison with other Rank Lists

Sl. No.	Title of Journal	$\frac{s}{d}$	$\frac{b}{d} \times 2$	c x 4	p x 8	U_f	Earlier Rankings according tof		
							Singh M 1967	(1978) 1976	Singh R S (1974)
1.	Tetrahedron Letter	8.575	4.550	300	24	337.125	8	3	9
2.	J Organic Chemistry	4.000	19.600	232	16	271.600	3	4	5
3.	Heterocycles	3.357	1.143	100	40	144.500	-	-	-
4.	Tetreahedron	5.750	2.000	136	0	143.750	14	5	4
5.	Synthesis	5.900	9.800	120	8	143.700	-	-	-
6.	J Heterocyclic Chemistry	1.625	3.750	124	0	129.375	77	19	158
7.	Chemistry & Industry	3.103	1.931	40	64	109.340	10	21	20
8.	J Medicinal Chemistry	1.875	0.250	100	0	102.125	71	26	-
9.	Chemical Communication	6.375	1.833	68	16	92.208	26	6	-
10.	Phytochemistry	4.000	0.706	56	0	60.706	91	30	62
11.	Planta Medica	3.200	5.600	48	0	56.800	-	-	-
12.	Perkins Transaction, I	2.429	0.571	48	0	51.000	-	-	-
13.	J Natural Products	1.700	0.400	44	0	46.100	-	-	-
14.	Canadian J Chemistry	2.167	0.667	28	0	30.834	19	14	19
15.	Chemistry Letters	4.538	2.154	20	0	26.692	-	-	-
16.	Chemical Society Review	1.000	5.000	12	0	18.000	-	-	-
17.	J Pharmaceutical Science	1.125	0.000	16	0	17.125	-	-	165
18.	Chemical Review	3.222	1.556	12	0	16.778	-	-	26
19.	Accounts of Chemical Research	1.600	2.000	8	0	11.600	-	-	-
20.	J Agricultural & Food Chemitry	2.500	0.040	0	8	10.540	-	-	-
21.	Perkins Transaction, II	3.500	0.333	0	0	3.833	-	-	-

s = number of users who signed on the slip during display,
d = number of issues of the titles received and displayed,
b = number of borrowers who were issued the displayed journals,
c = number of citations given in papers submitted for publication to the titles under study,
p = number of papers published in the titles under study.

to be essential for procurement. Rest of the primary foreign titles were considered for ranking according to their use pattern in the following different ways.

1. The readership assessement of 1396 issues of 166 foreign titles received in the library from February 1, 1990 to 31st August 1991 was made during their display. A slip designed for this purpose, was attached with each issue of the journal selected for the study inside the cover page requesting the user to put his signature after the use of the issue. The issues of the journals were kept on the display table for three days and then transferred to the alloted pigeon holes with the slip still inside the issue so that the users could record their use even if they missed it on the display table. On Ist September 1991 the slips were removed and the signatures were counted.

2. The issue slips received from the R&D staff for overnight loan of the issues of the journals during the period of study were preserved and were counted to make the assessment of the readership.

3. The citations appended in 111 research papers submitted for publication during the period under study by the R&D staff of the laboratory were analysed and the citations to each of the foreign journals under subscription were analysed.

4. The research papers published by the scientists from the laboratory in each of these journals were counted.

WEIGHTAGE

All these four countings for each of the journals were then computed using the following formula designed specifically for the purpose to get the use factor (U_f) for each journal.

$$U_f = \frac{s}{d} \mathrm{X}\ 1 + \frac{b}{d} \mathrm{X}\ 2 + c\ \mathrm{X}\ 4 + p\ \mathrm{X}\ 8$$

Where

s = number of users of issues of the journals received and displayed during the period of study,

d = number of issues of the journals received and displayed.

b = number of borrowers of issues of journals received and displayed,

c = number of citations in the papers submitted for publication from the laboratory in the foreign journals under consideration

p = number of papers published in the foreign journals under consideration.

and 1,2,4, and 8 are the weightages applied. The journals were then grouped disciplinewise and arranged in sequence of use factor.

No weightage was given to the method of counting the signature during display as many of the scientists read the displayed journals desultorily and often browse the journals not falling necessarily under their own disciplines/functional areas/specializations. Still browsing of journals is important as it keeps the scientists aware of the current developments in diverse fields and helps in generation of new ideas. On the contrary, the borrowing of journals for overnight use reflects a more genuine readership of the journal. Such journals are definitely more essential than the journals seen by the readers casually during display and therefore, the counting of borrowed journals was given double the weightage of the former.

Research papers are the final outcome of the R&D work carried out in a particular discipline (barring R&D work where publications are prohibited to avoid interference with marketing of process/products or contractual obligations). A higher weightage of 4 was given to those journals which were cited by the scientists in their papers than those used for borrowing. It is widely accepted that a cited article is usually somewhat relevant to the research reported in the citing article and the cited papers are not only definitely used by the citing authors but also the journals bearing such articles represent the area of work of the citing authors. Therefore, the frequency with which a particular journal is cited would provide a quantitative measure of the utility of the journal.

"A journal usually represents distinct niche of science covering one or more topic areas within a

Table 2

Rank List of Biochemistry Journals and its Comparison with other Rank Lists

Sl. No.	Title of Journal	$\frac{s}{d}$	$\frac{b}{d} \times 2$	c x 4	p x 8	U_f	Ranking according to Sengupta's Microbiol Journal (1989)	Ranking according to Sengupta's Biochem Journal (1973)
1.	Biotechnology and Bioengineering	3.455	0.000	124	0	127.455	66	-
2.	J Biological Chemistry	1.000	0.000	56	0	57.000	8	1
3.	Agricultural & Biological Chemistry	1.000	0.000	28	0	30.727	-	-
4.	J Fermentation & Bioengineering	2.765	0.118	16	0	18.833	-	-
5.	Applied Microbiology & Biotechnology	2.067	0.533	16	0	18.600	-	-
6.	Biochemica et Biophysica Acta	1.333	0.000	16	0	17.333	7	3
7.	Archives of Biochemistry & Biophysics	1.087	0.000	16	0	17.087	17	10
8.	Enzym & Microbial Technology	3.429	0.571	4	8	16.000	-	-
9.	Canadian J of Microbiology	2.167	1.000	12	0	15.167	18	-
10.	Antonie Van Leeuwenhoek	2.600	0.200	12	0	14.800	-	-
11.	Archives of Microbiology	2.200	0.200	12	0	14.400	21	-
12.	Folia Microbiologia	2.200	0.000	12	0	14.200	71	-
13.	J Applied Bacteriology	1.615	0.154	8	0	9.769	48	-
14.	Biochemical Journal	0.808	0.000	8	0	8.808	15	8
15.	J General & Applied Microbiology	2.400	0.000	4	0	6.400	78	-
16.	Geomicrobiology Journal	1.000	2.000	0	0	3.000	-	-
17.	Process Biochemistry	2.000	0.400	0	0	2.400	-	
18.	Plant & Soil	1.455	0.182	0	0	1.637	-	-

Table 3

Rank List of Geoscience Journals and its Comparison with other Rank Lists

Sl. No.	Title of Journal	$\frac{s}{d}$	$\frac{b}{d} \times 2$	c x 4	p x 8	U_f	Earlier Ranks according to	
							Pravathamma, (1991)	Nijagunappa, (1985)
1.	Tectonophysics	0.419	0.516	92	0	92.935	7	10
2.	Seismological Soc. of America Bull	2.000	8.000	44	0	54.000	-	-
3.	Geological Soc of America Bull	0.889	0.222	32	0	33.111	6	4
4.	J Geophysical Research	1.200	1.200	28	0	30.400	18	22
5.	American Assoc Petroleum Geologist Bull	0.461	1.000	12	0	13.461	26	19
6.	Mineraleum Deposita	1.000	12.000	0	0	13.000	-	-
7.	Geophysical Journal International	1.000	2.000	8	0	11.000	-	-
8.	Physics of the Earth & Plenatory Interior	0.615	0.308	4	0	4.923	-	-
9.	Izvestia-Physics of the Solid Earth	0.000	0.000	4	0	4.000	-	-
10.	Seismological Research Letter	0.500	3.500	0	0	4.000	-	-
11.	Economic Geology	0.500	1.667	0	0	2.167	4	14
12.	Earthquake & Volcano	1.286	0.857	0	0	2.143	-	-
13.	Geochemica et Cosmochemica Acta	0.643	0.857	0	0	1.500	8	7
14.	J Petrology	0.750	0.500	0	0	1.250	16	21
15.	Bull International Seismological Centre	0.308	0.154	0	0	0.462	-	-

scientific discipline". A journal, therefore, publishes only those papers which fall under its topical area/areas. Further, normally the scientists also prefer to publish their work in reputed core journals to disseminate the research to wider peers. Therefore, highest weightage of 8 was given to those journals wherein research work of the scientists from the laboratory was published, as these journals were considered to be the most preferred journals for the scientists.

DISCUSSION

Though 166 foreign journals serving twelve disciplines/functional areas were covered, yet the discussion is confined to 72 journals serving four major disciplines, viz., organic chemistry, biochemistry, geoscience and inorganic chemistry. The journals covered under each discipline arranged in order of their use factor (U_f) are presented in Tables 1,2,3 and 4 respectively. The rankings of journals in the first three areas by other workers are also presented alongwith to facilitate the comparison. The utilization of ten other multidisciplinary/popular journals subscribed to serve the diverse interest is shown in Table-5.

From the tables 1-4 it is seen that as compared to the geoscience and inorganic chemistry journals the organic chemistry journals were more used. The incidence of higher U_f in these two groups of journals were mainly due to higher rate of citations from these journals by the scientists from both the disciplines.

The library subscribed to 21 journals core to the field of organic chemistry (Table-1) and during 1990 and 1991 in seven of these journals 22 papers were published and 378 citations from 19 of them were cited in papers submitted for publication by the scientists during February 1990 to August 1991. The journals mostly used for publication of papers were Chemistry & Industry, Heterocycles, Tetrahedron Letter, Chemical Communication and Journal of Organic Chemistry. Another four journals used for publication of their work were Perkins Transaction-I, Phytochemistry, Journal of Heterocyclic Chemistry and Tetrahedron in which 3,3,5 and 7 papers were published in the respective order during the earlier five years (1985-1989). Tetrahedron Letter was the most cited journal followed by Journal of Organic Chemistry. The higher U_f recorded for the first 15 journals indicated that these journals are very essential for the R&D work in organic chemistry and their deletion will be detrimental. The later five journals are comparatively less useful and can be considered for deletion if funds do not permit.

In Biochemistry (Table-2) out of 18 journals subscribed only one journal published one paper during 1990-91 whereas 15 journals were cited by the scientists in their papers submitted for publication during the period under study. Biotechnology & Bioengineering was the most cited journal and 31 citations to this found place in the papers submitted for publication by the scientists followed by Journal of Biological Chemistry with 14 citations. The (U_f) s of these journals were low as compared to those of the organic chemistry journals because less number of papers were published in these journals. In geoscience journals (Table-3) no paper was published but 8 of the journals were cited by the scientists and Tectonophysics with 23 citations topped the list of 15 journals. Under inorganic chemistry 18 journals are listed, based on functional areas. However, most of the journals represent some microareas/subdisciplines falling under that discipline. In these journals only two papers one in Cement & Concrete Research and the other in J Thermal Analysis were published but one to six citations were given from eight journals. Most of the geoscience and inorganic chemistry journals were of low U_f because these journals were either poorly cited and/or very few papers were published in these journals. The comparatively low U_f of the journals in biochemistry, geoscience and inorganic chemistry do not mean that these are less useful and dispensible. But to meet the budgetary constraints some of the journals towards the bottom of the list may be considered for deletion.

Of the ten journals listed under general group (Table-5), five were cited by the scientists from seven disciplines of the laboratory. The maximum number of 12 citations were from Nature followed by Chemtech (10 citations) and Science (8 citations). In none of the journals papers were published but barring one journal other nine were highly browsed during display and taken on loan.

A comparison of the rankings of journals under each discipline with those by the other workers

Table 4

Rank List of Inorganic Chemistry Journals and its Comparison with other Rank Lists

Sl. No.	Title of Journal	s - d	b - x 2 d	c x 4	p x 8	U_f	Earlier Ranks according to Singh M 1967	 (1978) 1976	 Singh R S (1974)
1.	J Thermal Analysis	0.571	0.000	24	8	32.571	-	-	-
2.	Cement & Concret Research	1.750	2.000	16	8	27.750	-	-	-
3.	J Petroleum Technology	0.000	1.250	24	0	25.250	-	-	-
4.	Separation Science & Technology	2.000	0.769	12	0	14.769	-	-	118
5.	Oil & Gas Journal	0.530	0.121	12	0	12.651	-	-	-
6.	Inorganic Chemistry	2.368	0.211	8	0	10.579	18	15	17
7.	American Ceremic Society Journal	1.500	2.500	4	0	8.000	-	-	-
8.	American Ceramic Society Bulletin	1.300	0.200	4	0	5.500	-	-	-
9.	Zeolite	1.000	4.000	0	0	5.000	-	-	-
10.	Adv Cement Research	2.333	1.333	0	0	3.666	-	-	-
11.	SPE Reservuir Engineering	0.750	1.500	0	0	2.225	-	-	-
12.	SPE Production Engineering	0.000	2.000	0	0	2.000	-	-	-
13.	Applied Clay Science	1.000	0.667	0	0	1.667	-	-	-
14.	World Cement	0.737	0.730	0	0	1.467	-	-	-
15.	Catalysis Review	0.400	0.800	0	0	1.200	-	-	-
16.	J Candian Petroleum Technology	0.500	0.000	0	0	0.500	-	-	-
17.	SPE Formation Evaluation	0.500	0.000	0	0	0.500	-	-	-
18.	SPE Drilling Engineering	0.000	0.000	0	0	0.000	-	-	-

reveals that in organic chemistry nine of the subscribed journals occupying Ist, 2nd, 4th, 6th, 7th, 10th, 14th, 17th and 18th position also find place in the ranking of 219 journals done by Singh [18] who ranked the periodicals in chemistry from the point of view of Indian scientists. Of the nine journals from the present list, six appeared at one or the other place from 4th to 26th ranks in his list of journals. Similarly nine of the journals occupying the positions between 1 to 14 were also found in the rank list of thirty journals prepared by Singh [17] based on the study of Chemical Review for the year 1976. The Tetrahedron Letter, J Organic Chemistry and Tetrahedron which were ranked Ist, 2nd and 4th based on U_f also occupied 9th, 5th and 4th positions respectively in the R.S. Singh's list [18] and 3rd, 4th and 5th positions in the M.Singh's list [17]. This shows that in organic chemistry the rankings in the present study more or less conform to the rankings done by others through citation analysis in two different base journals in national and international context. This means that the nature of work done in the Organic Chemistry Division of the laboratory is highly basic in nature and the journals occupying the higher ranks in these lists mostly publish basic works which are highly cited.

In the field of biochemistry (including microbiology), Biotechnology & Bioengineering, J Biological Chemistry, Agricultural & Biological Chemistry, J Fermentation & Bioengineering, Applied Microbiology & Biotechnology, Biochemica et Biophysica Acta and Archives of Biochemistry & Biophysics occupied the first seven ranks in the sequence of use factor. Three journals, namely, J Biological Chemistry, Biochemica et Biophysica Acta and Archives of Biochemistry & Biophysics occupied 8th, 9th and 17th position in the ranking of microbiology journals done by Sengupta [15] but occupied Ist, 3rd and 10th position in the ranking of biochemistry journals done by him later [11] and 2nd, 6th and 7th positions respectively in the present ranking. The Biochemical Journal occupied 15th position in Sengupta's microbiology rankings of periodicals and 8th position in the ranking of biochemistry journals [11] against the 14th position occupied in the present list. This shows that there is little difference between present ranking with those of Sengupta. The journal of Biotechnology & Bioengineering which occupied Ist position in present study was ranked 66th by Sengupta [14]. One obvious reason for this variation is that biotechnology and bioengineering are the thrust areas of research in Biochemistry division of the laboratory.

In geoscience, seven out of the fourteen journals subscribed by the library are finding place amongst the list of eighteen foreign journals (total 20 journals including 8 Indian journals) used highly by Indian scientists prepared by Pravathamma et al [10] and in sixteen foreign journals (total 22 including 6 indian) prepared by Nijagunappa & Nijagunappa [8]. The journals occupying Ist, 3rd, 4th, 5th, 11th, 13th and 14th in the present ranking are seen at 7th, 6th, 18th, 26th, 4th, 8th and 16th position respectively in the ranking list prepared by Pravathamma et al [10] and 10th, 4th, 22nd, 19th, 14th, 7th, and 21st position in the ranking list prepared by Nijagunappa and Nijagunappa [8]. Since the bulk of the research done in geoscience division of the laboratory is basic in nature, the conformity of the three lists with slight variation seems to be explicable.

In inorganic chemistry only the Journal of Inorganic Chemistry occupying 6th position in the present list is finding place in both the ranking lists prepared by R.S. Singh [18] and M Singh [17] for chemistry journals. Most of the journals used by the chemistry division cover highly specialised areas of applied research. These journals are, therefore, poorly cited and their position in the bibliographical citations based rankings will be naturally low or absent. Since cement, oil field chemicals and beneficiation of ores are forming core areas of research in this division, the incidence of high use factors in the journals covering these areas is conspicuously clear.

CONCLUSION

Though it is not claimed that the ranking of journals based on the above criteria is free from drawbacks, the above use based ranking may be considered a practical tool to select journals of maximum utility for a library of any R&D organization to tide over the financial crisis due to the price hike of journals and limitation of resources. The ranking of journals within the discipline provides an approach for inclusion or exclusion of journals to the extent the budget permits. However, the relative importance of a specific journal for scientific library may change due to shift in R&D work of the institution or emergence of more appropriate

Table 5

Rank List of Journals of General Interest

Sl. No.	Title of Journal	$\frac{s}{d}$	$\frac{b}{d} \times 2$	c x 4	p x 8	U_f
1.	Nature	3.569	1.140	48	0	52.709
2.	Chemtech	3.533	2.267	40	0	45.800
3.	Science	3.429	1.143	32	0	36.572
4.	Scientific American	2.444	4.667	8	0	15.111
5.	New Scientist	3.451	2.392	8	0	13.843
6.	Discover	2.615	6.000	0	0	8.615
7.	R&D Management	2.333	3.333	0	0	5.666
8.	Futurist	2.571	2.286	0	0	4.857
9.	Impact of Science on Society	1.000	3.000	0	0	4.000
10.	Technology Review	0.500	0.200	0	0	0.700

journal covering sub-disciplines representing the institution's work. So, periodic review of the ranking of journals would be beneficial.

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REFERENCES

1. CHANDEL A S AND SARAF V : Overlapping in periodical acquisition - a study of special libraries of Lucknow, In : Planning in Library Resource Sharing, ed by Chandel and Veena; 1987. Print House, Lucknow. p.178.
2. Policy on Indian edition of foreign S&T periodicals (Editorial). Current Sci. 1989, 58 (17), 948.
3. GUPTA D K AND GUPTA S : Periodical literature in petroleum geology - a citation analysis study of obsolescence factor. IASLIC Bull. 1983, 28, 75-86.
4. HADAGALI P B: Frequently cited periodicals by Indian agricultural economist - a citation analysis. IASLIC Bull. 1983, 28, 59-66.
5. HOLDEN C : Libraries stunned by journal price increase. Science. 1987, 236 (4804), 908-909.
6. KUMAR D: A decade of rising subscription rates of Indian, British and US chemical journals - a preliminary analysis. Ann Lib Sci Doc. 1976, 23 (2), 189-194.
7. ARJUN LA L : Ranking of periodicals in the field of Soil Science. Ann Lib Sci Doc .1990, 37 (2), 67-73.
8. NIJAGUNNAPPA R AND NIJAGUNNAPPA P : Core journals used by Indian geoscientists (1978-82). J Geol Soc India. 1985, 26, 101-108.
9. OMOTOSO R O : Price trend in geophysics journals 1975-1985. IASLIC Bull. 1988, 33 (1), 1-5.
10. PARVATHAMMA N, GUNJAL S R and NIJAGUNNAPPA R: Core journals in earth science - a comparative study. J Geol Soc India. 1991, 38 (4), 387-395.
11. SENGUPTA I N : Bibliometrics and identification of core periodicals. Herald of Lib Sci. 1980, 29 (3-4), 226-247.
12. SENGUPTA I N : Growth of the biochemical literature. Nature. 1973b, 244 (5411), 75-76.
13. SENGUPTA I N: Choosing pharmacology periodicals - study of growth of literature in the field. Ann Lib Sci Doc. 1974a, 21, 1-21.
14. SENGUPTA I N : Choosing of microbiology journals - a study of growth of literature in the field. Ann Lib Sci Doc 1974b, 21, 95-111.
15. SENGUPTA I N : Weightage formula to rerank periodicals in the field of microbiology. Scientometrics. 1989, 17 (3-4), 289-300.
16. SINGH J P : Rising trend in subscription rate of military science journal. ILA Bull. 1990, 26 (2), 95-106.
17. Singh M : Studies of chemical literature and changes in the ranking of periodicals by citation analysis of data for 1967-76. Ann Lib Sci Doc. 1978, 25 (1-4), 55-61.
18. Singh R S : Ranking periodicals in chemistry from the point of view of Indian scientist. Ann Lib Sci Doc. 1974, 21, 55-67.

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A STUDY OF BIBLIOGRAPHIC COUPLING IN LINGUISTIC RESEARCH

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The concept of bibliographic coupling in the area of citation analysis and its applicability to linguistic research are discussed. The coupling indexes are computed on the basis of sample articles from socio-linguistics and grammar published in the journals Indian Linguistics and Language.

INTRODUCTION

Research in every discipline, be it linguistics or physics, is growing so much and so vast that a researcher is likely to get lost in this information explosion. An information scientist helps a researcher to keep track of the developments in his field of work. Many techniques developed in information science help in the organization and dissemination of knowledge in various disciplines as well as in the appraisal of the latest trends that are taking shape within each discipline: One of the techniques is citation analysis.

The term 'citation' refers to the full bibliographical description of a referred material (be it a book, a journal, a thesis, a report or a paper) which is used or is relevant to a particular research work. A systematic study of citations in a discipline, provides a criterion for measuring the degree of interaction among the researchers. One of the principal concept of citation pattern is bibliographic coupling.

The concept of bibliographic coupling arises when two articles cite one or more papers in common. While discussing the citation patterns and analysis, Sharma [5] states that "when two papers cite the same reference or have at least one reference common in them, then there may exist some relation between the two citing papers". Also if their bibliographies had half a dozen earlier articles in common the assumption that they covered the same subject is justified. That is, the stronger the bibliographic coupling between two articles, the more similar are the subjects covered in them [2]. The number of such common references in two articles is used in measuring the coupling strength between them. In general, bibliographic coupling links the source documents and provides a clue to an information scientist about the relatedness of two documents. Clustering of literature based on bibliographic coupling yields meaningful collection of papers within a field and it is of great importance in computerized information retrieval, indexing and preparation of subject bibliographies.

Though the notion "bibliographic coupling" has its history since the year 1955, limited amount of research has been carried out to examine its applicability and utility in various disciplines, especially in humanities and social sciences. Hence the need to develop such indices in the area of linguistics was felt.

METHODOLOGY

The idea of bibliographic coupling was developed at MIT (Massachusetts Institute of Technology) in a project TIP (Technical Information Project) by M.M. Kessler [2].

The only procedure to obtain a matrix of conditional relevance measure for any two articles was given by M.M. Kessler as follows:-

a) Establish the coupling strength by noting the number of common citations given in two papers, x_i and x_j in any field M. Denote this coupling strength by $m(x_i \cap x_j)$

b) Denote the number of citations given in each of the articles x_i and x_j by $m(x_i)$ and $m(x_j)$ respectively

c) The bibliographic coupling strength between two papers, i.e. P_{ij} is defined as $m(x_i \cap x_j)/m(x_i)$ and

The P_{ji} is defined as $m(x_i \cap x_j)/m(x_j)$

An improvement over Kessler's formula is proposed for measuring the strength of bibliographic coupling between two papers. It is as follows:-

Let i and j be two articles from any field. Let n_i, n_j and r_{ij} refer to the number of citations in the papers i, j and the number of citations that are common to both i and j respectively. The Bibliographic Coupling strength or the coupling index T_{ij} is given by the formula,

$$T_{ij} = \frac{r_{ij}}{\sqrt{n_i \times n_j}} \qquad (1)$$

Which is, the number of common citations divided by the square root of the product of the number of citations in the paper i and the paper j.

This formula is an improvement over Kessler's formula because it is symmetric with respect to the pair of articles under consideration and also it can be treated as a co-efficient of correlation between the two papers.

For the comparison of two or more sets of documents on different topics on the basis of their citations and also the bibliographic coupling, the following procedure is suggested.

Let there be N articles in a set and let n_i be the number of citations in ith article where i = 1,2,3...N. The minimum and maximum number of citations per article are found, in addition to the average and standard deviations.

The mean or average of citations is given by

$$\text{mean of citations} = \frac{\sum_{i=1}^{N} ni}{N} \qquad (2)$$

The standard deviation, which is a measure of variability in the data is given by

$$\text{S.D.} = \sqrt{\sum_{i=1}^{N} \frac{(ni-mean)^2}{(N-1)}}.$$

Different sets of documents can be compared by evaluating and comparing these statistics.

The bibliographic coupling strength T_{ij} can be computed for every pair in the set. T_{ij} may be computed with the help of (1) for each of the ${}^{N}C_2$ where ${}^{N}C_2$ is the number of combinations of any two documents in a set of N documents) pairs of documents and then the values may be compared.

SAMPLE STUDY

For the purpose of this study two journals i.e. 'Indian Linguistics' and 'Language' published by the Linguistic Society of India, Poona and the Linguistic Society of America, respectively were chosen. It was decided to cover articles belonging to two sub-disciplines of linguistics namely, 'sociolinguistics' and 'grammar' from both the journals. To represent these two areas six articles were chosen in each area from each journal, thus totaling 24 articles. All the bibliographic details and number of citations/references were noted for every chosen article (Appendix A).

The distribution of the number of citations in the subjects viz., 'sociolinguistics' and 'grammar' are observed separately for the two journals. Table 1 present a statistical analysis of these distributions. The table gives under each subject for every journal the minimum number of citations per article, the maximum number of citations per article, the average number of citations of the articles and the standard deviation of the number of citations.

Table 1

Distribution Patterns of the Number of Citations per Article

Subject / Journal		Sociolinguistics	Grammar
Indian Linguistics	Minimum No. of Citations	12	6
	Maximum " "	30	38
	Average " "	19.17	16
	Standard Deviation	7.67	12
Language	Minimum No. of Citations	21	23
	Maximum " "	348	100
	Average " "	96.17	62
	Standard Deviation	125.3	29.72

The articles are considered in pairs, i.e., from the Indian Linguistics journal, the six articles selected in sociolinguistics give rise to 15 pairs ($^6C_2$). For each pair, the parameters n_i, n_j and r_{ij} were noted down, which are : the number of citations in the ith articles, the number of citations in jit articles and number of citations that are common to both the articles respectively (Appendix B). The coupling index for each pair was calculated on the basis of these numbers according to the formula (1) proposed earlier in this paper. It is noticed that some of the pairs do not have any common citations. Hence a coupling rate is also calculated for each sub-discipline separately for the two journals by the following formula:

$$\text{coupling rate } C_R = \frac{100\text{x No. of pairs containing citations in common}}{\text{Total Number of pairs}}$$

After obtaining coupling index for each pair, average of all these indices is calculated for each subject in every journal and is illustrated in Table 2.

Table 2

Patterns of Bibliographic Coupling for Articles

Subject / Journal	Sociolinguistics		Grammar	
	Coupling rate	Bibliographic Coupling Index	Coupling rate	Bibliographic Coupling Index
Indian Linguistics	20%	Minimum .064 Maximum .101 Average .078	40%	Minimum .066 Maximum .165 Average .112
Language	13.33%	Minimum .0087 Maximum .0088 Average .00875	60%	Minimum .014 Maximum .040 Average .029

ANALYSIS

From Table 1, it can be seen that articles from `Indian Linguistics' tend to give less number of citations than their counter-parts from the `Language' Journal whether the subject is grammar or sociolinguistics. From the Appendix A it can be noticed that, even among articles from the `Indian Linguistics', Indian authors give less number of citations than that of the foreign authors. The variability as represented by the standard deviations, is less for `Indian Linguistics' than for `Language' for both 'sociolinguistics' and 'grammar' indicating that 'Indian Linguistics' is constant in giving limited number of citations as compared to 'Language'.

When the subjects are compared, the trends are the same for both the journals. Articles in 'sociolinguistics' give more citations than those in 'grammar'. This may be due to the fact that 'grammar' is a very technical topic and there is a dominant paradigm and the number of paradigm is limited. Whereas 'sociolinguistics' is a broader area of inter-disciplinary research covering diverse aspects of language and linguistics and there is no paradigm and a said model. All the researchers in this area have their own way of interpretation which indicates that there is no single direction in sociolinguistics. Therefore, the patterns of distributions in both the areas indicate that there is more variability in the number of citations for 'sociolinguistics' than for 'grammar' whether the journal be Indian Linguistics or Language.

From Table 2, it is observed that the coupling rate is maximum (60%) in the articles on 'grammar' and minimum (13.3%) in the articles on 'sociolinguistics' in the journal 'Language'. Thus, it is interesting to note that though there are more citations in articles on 'sociolinguistics', there is very little bibliographic coupling exhibited among the citations of various pairs of articles. Same is the case with articles from Indian Linguistics also. It can also be seen that the values of the bibliographic coupling index are consistently low. Maximum coupling is observed in the case of the articles from Indian Linguistics dealing with 'grammar' and minimum (barring zero values from the analysis) is for articles on 'sociolinguistics' from the Language. However, sociolinguistics from the Indian Linguistics presents a slightly better picture.

CONCLUSIONS

The following conclusions may be drawn from the above study.

a) The journal `Indian Linguistics' is consistent in giving limited number of citations as compared to `Language'.

b) Articles on sociolinguistics give more citations than those on grammar in both the journals depicting the limited paradigm in grammar and broader outlook in sociolinguistics.

c) Coupling rate is maximum in the case of grammar compared to that of sociolinguistics.

Uses of Bibliographic Coupling

The bibliographic coupling provides a clue to the relatedness of papers purely on structural rather than substantial grounds. Such external clues in some respects superior to the actual examination of the text, help the classifier and the researchers in searching the document. It is even independent of language.

Further, the documents having high coupling strength with a particular document enable the researchers to cover the area of his interest comprehensively and systematically. When the coupling index is taken as the criterion to include a document in the bibliography, special bibliographies can be automatically compiled with the help of a computer. Supporting this statement by the application of the principles of bibliographic coupling designed by M.M. Kessler in MIT Technical Information Project, nearly 1,200 articles are entered in a month. The information given for each includes author, author's affiliation, title, citations and bibliographic reference [2].

The present study is based on a very small sample. A similar study based on a larger data of linguistic research may provide a more comprehensive picture.

This procedure is analogous to cluster analysis in statistics.

REFERENCES

1. DONOHUE J C : Understanding scientific literature - a bibliometric approach. Cambridge, MIT, 1981.
2. FOSKET A C : The subject approach to information. London, Clive Bingley & Linnet Books, 1982.
3. GOFFMAN : An indirect method of information retrieval. Information Storage and Retrieval. 1969, 4, 361-373.
4. NICHOLAS D and RITCHIE M : Literature and bibliometrics. Linden & Hamden, Clive Bingley & Linnet Books, 1978.
5. SHARMA C : Citation patterns and analysis. ILA Bulletin. 1981, 17 (3-4), 234-240.

Appendix A

List of Articles Selected for Bibliographic Coupling

Subject : Sociolinguistics
Name of the Journal: Indian Linguistics

Sl.No.	Citing Author	Title	Vol. & Issue No.	Year	No. of Citations
1.	Bean, S.	Linguistic variation and the caste system in South Asia	35 (4)	1974	27
2.	Berntsen, M.	The study of language as a social fact	33 (4)	1972	30
3.	Dua, H.R.	Planning language use in radio broadcast in a multilingual context	41 (1)	1980	14
4.	Karunakaran, K.	Language planning in a multilingual context	40 (3)	1979	12
5.	Kothari, S.S.	Social stratification and the process of language standardization	36 (3)	1975	13
6.	South Orth, F.C.	On the need for qualitative data to supplement census language statistics-some proposals based on the Indian census	39	1978	19

Appendix A (contd.)

Name of the Journal: Language

Sl.No.	Citing Author	Title	Vol. & Issue No.	Year	No. of Citations
1.	Dore, J. and Modermott, R.P.	Linguistic indeterminacy and social context in utterance interpretation	58 (2)	1982	47
2.	Naro, A.J.	The social & structural dimensions of a syntactic change	57 (1)	1981	21
3.	Pfaf, C.W.	Constraints on language mixing - intrasentential code-switching and borrowing in Spanish/English	55 (2)	1979	38
4.	Silverstein, M.	Chinook Jargon - language contact & the problem of multi level generative systems	48 (2)	1972	37
5.	Wexler, P.	Jewish interlinguistics	57 (1)	1981	348
6.	Witkowski, S.R. and Brown, C.H.	Marking reversals and cultural importance	59 (3)	1983	86

Appendix A (contd.)

Subject: Grammar
Name of the Journal: Indian Linguistics

Sl.No.	Citing Author	Title	Vol. & Issue No.	Year	No. of Citations
1.	Dasgupta, P.	The internal grammar of compound verbs in Bangla	38 (2)	1977	13
2.	Nadkarni, M.V.	Sentential complements on nouns in Kannada	33 (1)	1972	6
3.	Olphen, H.V.	Functional & non-functional conjunct verb in Hindi	34 (4)	1973	11
4.	Rangan, K.	Some problem in Tamil passive constructions	40 (4)	1979	7
5.	Shapire, M.C.	The analysis of Hindi morphologically related verb sets	37 (1)	1976	38
6.	Sinha, A.C.	A phrases structure rule for Hindi noun phrase & universal grammar	37 (1)	1976	21

Appendix A (contd.)

Name of the Journal: Language

Sl.No.	Citing Author	Title	Vol. & Issue No.	Year	No. of Citations
1.	Blom, L. et al	Semantics of verbs and the development on verb inflection in child language	56 (2)	1980	38
2.	Clark, E. and Clark, H.	When nouns surface as verbs	55 (4)	1979	67
3.	Gross, M.	On the failure of generative grammar	55 (4)	1979	54
4.	Haiman J.	The iconicity of grammar	56 (3)	1980	90
5.	Hopper, P.J. and Thomson, B.A.	Transitivity in grammar and discourse	56 (2)	1980	100
6.	Shibatani, M.	Grammatical relations and surface cases	53 (4)	1977	23

Appendix B

Details of Bibliographic Coupling

Subject: Sociolinguistics
Name of the Journal: Indian Linguistics

Sl.	Couple	n_i	n_j	r_{ij}	$T_{ij} = [r_{ij}/\sqrt{n_i\text{-}n_j}\,]$
1.	1,2	27	30	2	0.070
2.	1,3	27	14	0	0
3.	1,4	27	12	0	0
4.	1,5	27	13	0	0
5.	1,5	27	13	0	0
6.	2,3	30	14	0	0
7.	2,4	30	12	0	0
8.	2,5	30	13	2	0.101
9.	2,6	30	19	0	0
10.	3,4	14	12	0	0
11.	3,5	14	13	0	0
12.	3,6	14	19	0	0
13.	4,5	12	13	0	0
14.	4,6	12	19	0	0
15.	5,6	13	19	1	0.064

Appendix B (contd.)

Details of Bibliographic Coupling

Subject: Grammar
Name of the Journal: Indian Linguistics

Sl. No	Couple	n_i	n_i	r_{ij}	$T_{ij} = [r_{ij}/\sqrt{n_i - n_j}]$
1.	1,2	13	6	0	0
2.	1,3	13	11	0	0
3.	1,4	13	7	0	0
4.	1,5	13	38	0	0
5.	1,6	13	21	0	0
6.	2,3	6	11	0	0
7.	2,4	6	7	0	0
8.	2,5	6	38	0	0
9.	2,6	6	21	0	0
10.	3,4	11	7	1	0.114
11.	3,5	11	38	2	0.098
12.	3,6	11	21	1	0.066
13.	4,5	7	38	2	0.123
14.	4,6	7	21	2	0.165
15.	5,6	38	21	3	0.106

Appendix B (contd.)

Details of Bibliographic Coupling

Subject: Sociolinguistics
Name of the Journal: Language

Sl. No	Couple	n_i	n_j	r_{ij}	$T_{ij} = [r_{ij}/\sqrt{n_i-n_j}]$
1.	1,2	47	21	0	0
2.	1,3	47	38	0	0
3.	1,4	47	37	0	0
4.	1,5	47	348	0	0
5.	1,6	47	86	0	0
6.	2,3	21	38	0	0
7.	2,4	21	37	0	0
8.	2,5	21	348	0	0
9.	2,6	21	86	0	0
10.	3,4	38	37	0	0
11.	3,5	38	348	1	.0087
12.	3,6	38	86	0	0
13.	4,5	37	348	1	.0088
14.	4,6	37	86	0	0
15.	5,6	348	86	0	0

Appendix B (contd.)

Details of Bibliographic Coupling

Subject: Grammar
Name of the Journal: Language

Sl.	Couple	n_i	n_j	r_{ij}	$T_{ij}= [r_{ij}/\sqrt{n_i\text{-}n_j}]$
1.	1,2	38	67	2	0.040
2.	1,3	38	54	0	0
3.	1,4	38	90	0	0
4.	1,5	38	100	2	0.032
5.	1,6	38	23	1	0.034
6.	2,3	67	54	1	0.017
7.	2,4	67	90	0	0
8.	2,5	67	100	3	0.037
9.	2,6	67	23	1	0.025
10.	3,4	54	90	1	0.014
11.	3,5	54	100	0	0
12.	3,6	54	23	1	0.028
13.	4,5	90	100	3	0.032
14.	4,6	90	23	0	0
15.	5,6	100	23	0	0

Annals of Library Science and Documentation 1993, 40(4), 138-145

LAYERED STRUCTURE OF COMPUTER NETWORKING FOR EFFICIENT MANAGEMENT OF A RESEARCH LABORATORY

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Office automation is gradually making headway in various organisations. Local Area Network (LAN) with different protocols in accordance with the Open System Interconnect (OSI) of the International Standards Organization (ISO) is suggested for the purpose. A layered structure for the application layer, i.e. the 7th layer of the ISO-OSI is suggested for a research laboratory. The research projects are considered as central layer with two preceding layers as input; the first one dedicated to the administrative support and second to the technical support. Utilization of the research results are assigned the 4th layer as an output layer. It is suggested that a number of computers may be placed in each layer for creating distributed databases and a master computer for the master database. An automatic dataflow system is suggested for smooth flow of data among various layers or various activities within a layer. Advantages of the proposed system are also described.

INTRODUCTION

Office automation all the way to what may be termed as paperless office has been practiced at different levels in various orgnisations [1] all over the world. The core of office automation is local area network (LAN) [2-5] of a number of computers. The purpose of such networking of computers is to provide the following facilities for better management.

- Resource Sharing
- Speedy communication between computers
- Possibility of distributed processing
- Establishment of distributed databases
- Automatic dataflow
- Common knowledge base

The basic working of a research laboratory is different from a government administrative organisation, a military unit, an industrial set-up or an educational institution. It becomes essential to establish a computer network and organise the functioning of a research laboratory for better coordination. Research projects form the main body of the work in a laboratory and all other activities are either input to these projects or output of these projects, as shown in Fig.1. Organisation of a research laboratory on this model helps in methodically arranging various kinds of activities in relation to research projects with a view to create a built-in accountability.

Further, the network could be utilised for the creation of a data bank and possibly knowledge base. Thus, not only the administrative but technical management of research organisation could also be optimised.

Though there are a number of protocols available for computer networking [6-8], the protocol Open System Interconnect (OSI) [9] of the International Standards Organisation (ISO) particularly suits the multivendor networking and is taken up for describing the proposed computer network. Six out of the seven layers proposed in the ISO-OSI are defined by the protocol, however, the seventh layer is left as application layer to be defined by the user. The present paper has described a layered structure for 7th layer of the ISO-OSI to cover all the activities in a research laboratory (Fig.2). The connectivities of various data bases and organisation of a decision support system has also been discussed.

LAYERED STRUCTURE FOR 7TH LAYER OF ISO-OSI

Research projects constitute the central activity of a laboratory and all other activities are either providing necessary input for the optimization of the project execution or drawing outputs from these projects for the utilisation of research results. The inputs to research projects could again be clearly defined in two distinct categories (Layers)

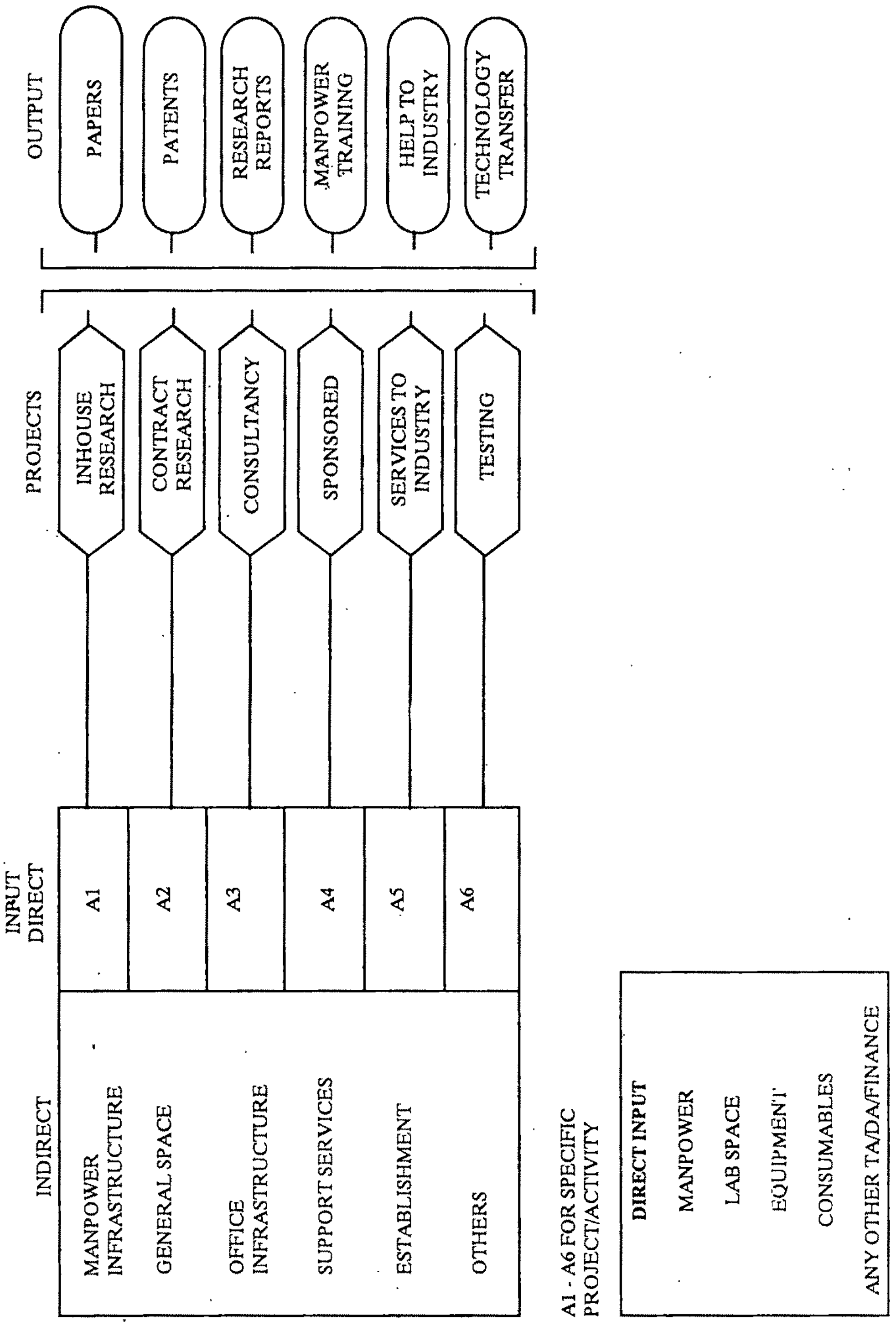
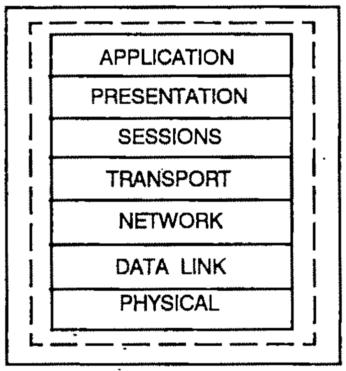

INDIRECT
MANPOWER INFRASTRUCTURE
GENERAL SPACE
OFFICE INFRASTRUCTURE
SUPPORT SERVICES
ESTABLISHMENT
OTHERS
INPUT DIRECT
A1
A2
A3
A4
A5
A6
PROJECTS
INHOUSE RESEARCH
CONTRACT RESEARCH
CONSULTANCY
SPONSORED
SERVICES TO INDUSTRY
TESTING
OUTPUT
PAPERS
PATENTS
RESEARCH REPORTS
MANPOWER TRAINING
HELP TO INDUSTRY
TECHNOLOGY TRANSFER
A1 - A6 FOR SPECIFIC PROJECT/ACTIVITY
DIRECT INPUT
MANPOWER
LAB SPACE
EQUIPMENT
CONSUMABLES
ANY OTHER TA/DA/FINANCE

FIG. 1



The OSI Model
Software Layer

FIG. 2

as follows:

a) Administrative set up including financial aspects

b) Support services

Main components of a) and b) are given as 'Layer 1 Input' and 'Layer 2 Input' in Table 1.

One could define the 7th layer of ISO-OSI for a research laboratory comprising four layers; two layers as input to the projects and one layer each for the output from the projects and the project execution. Activities in project execution and output layer are also listed in Table 1.

Table 1 *Layer-wise List of Activities*

Administration (Input Layer 1)

1. CSIR
2. Director
3. Committees, RC/EC
4. Outside agencies
5. Administration
6. Finance
7. Purchase
8. Store
9. Recruitment/Assessment
10. Form
11. Confidential
12. Personal record
13. Security
14. Communication
15. Lab maintenance
16. Medical
17. Construction
18. Staff quarter

Support Services (Input Layer 2)

19. Testing
20. Computing
21. Workshop
22. Publication unit
23. Liaison
24. PME Cell
25. Documentation
26. Library
27. Patent unit
28. Xeroxing

Project Execution (Execution Layer 3)

29. Execution of project
30. Experiment design
31. Material characterisation
32. Properties of material
33. Analysis
34. Result analysis
35. Feed back control
36. Field trial

Project Utilisation (Output Layer 4)

37. Release of know-how
38. Technology utilisation
39. Patent
40. Publication
41. Project report
42. Extension

All the activities in a research laboratory could thus be concentrated in these four layers. Layer-wise significance of each activity from 1 to 42 are shown in fig. 3. Layer-wise placement of network of computers is shown in fig. 4.

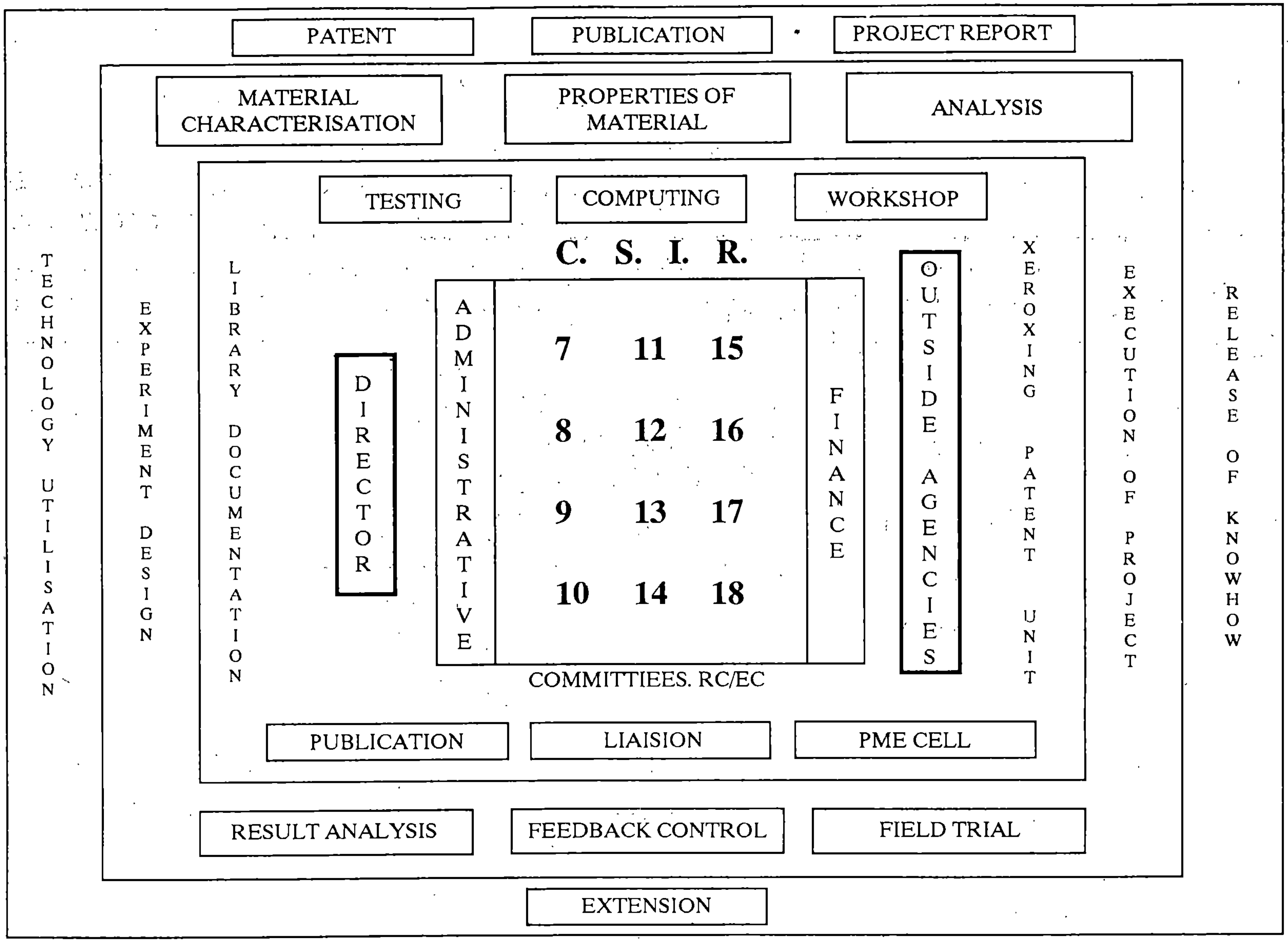
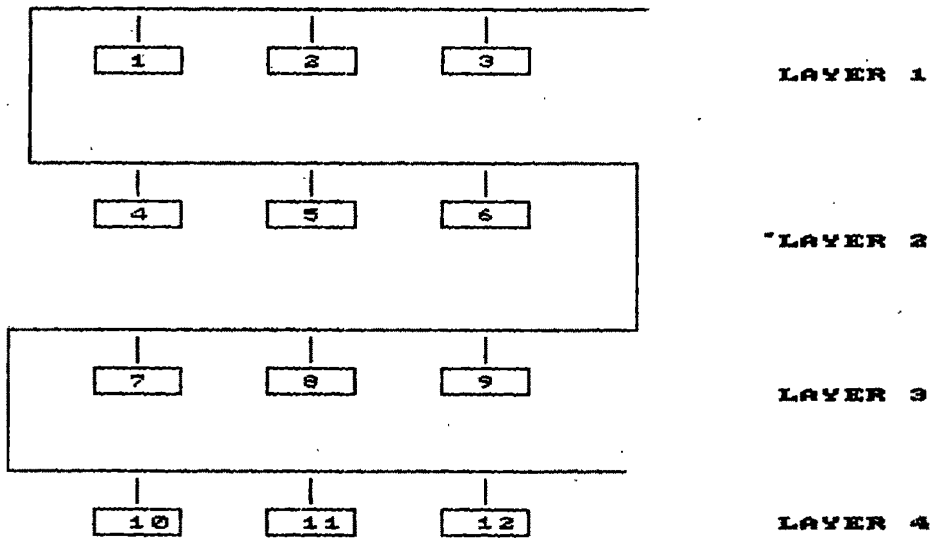
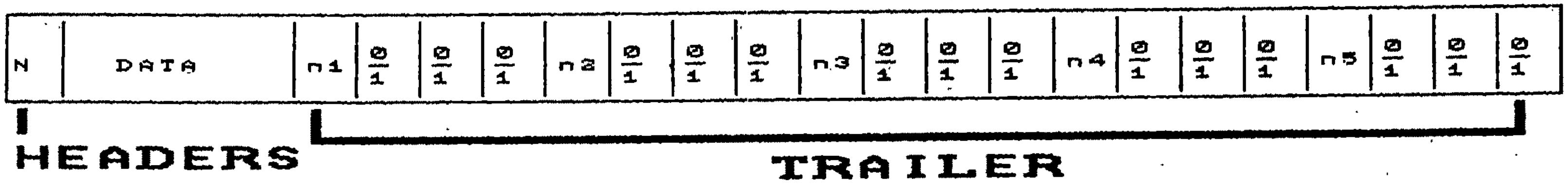

PATENT
PUBLICATION
PROJECT REPORT
MATERIAL CHARACTERISATION
PROPERTIES OF MATERIAL
ANALYSIS
TESTING
COMPUTING
WORKSHOP
C. S. I. R.
TECHNOLOGY UTILISATION
EXPERIMENT DESIGN
LIBRARY DOCUMENTATION
DIRECTOR
ADMINISTRATIVE
7
11
15
8
12
16
9
13
17
10
14
18
FINANCE
OUTSIDE AGENCIES
XEROXING PATENT UNIT
EXECUTION OF PROJECT
RELEASE OF KNOWHOW
COMMITTIEES. RC/EC
PUBLICATION
LIAISION
PME CELL
RESULT ANALYSIS
FEEDBACK CONTROL
FIELD TRIAL
EXTENSION

FIG. 3



BUS CONNECTED NETWORK
FIG.4



GENERATION OF HEADERS & TAILERS
FIG.5

COMPUTER NETWORKING

More than one computer could be placed in each layer to cover all the activities. A typical bus structure for the system of computers is shown in figure 4. It may be seen that maximum number of computers are placed in layer 3 which is the central layer and has not only the administrative work but also the work of information bases and that of the off line and on-line activity of various projects. There is also a mini computer shown as master computer * in layer 2. However, it may be placed any where depending upon the convenience. The function of each micro computer is to generate and store individual databases specific to the activities. The aim of placing a master computer is to hold the combined database or the master database from where individual data bases could be drawn for updating.

The master database also works as back up for individual databases. Two aspects essential for maintaining individual and master database are:

a) Proper identification of data to be duplicated in the master database from individual databases.

b) Connectivity of the activities in the whole system.

Once the decision is taken, a data flow system is to be evolved. A basic principle of a data flow system has been described in next section. Two examples of connectivity for personnel and material management have been discussed to explain the concept and importance of connectivity.

CONNECTIVITY

Connectivity may be defined as interrelation between various groups of activities to determine how much of data is common to them. The connectivity between individual databases (the databases maintained by each well defined activity such as establishment, stores, purchase, etc.) may be termed as 'direct connectivity'. However, the connectivity between master database and individual databases or between two individual databases through the master database, may be termed as 'indirect connectivity'. The function of working out connectivity for the entire system is to establish a data flow system in which data from each database flows automatically to their destined computers.

One point may be made clear that there may be two types of data in every database; related data and local data. Related data is the set of data which gets copied into more than one computer holding the individual databases. Local data is the set of data that is not required at places other than where it is generated. Typical examples of related and local data are given below:

Related Data

Salary record of staff members is required to be maintained at four different places. Establishment is required to keep the data in connection with the recoveries of loans, the finance requires it for ensuring correct payments, the project monitoring and evaluation cell keeps the data (projectwise) for maintaing the record of each group of scientists and lastly, each group of scientists (modules)** also keeps the data for their own record. The data on salaries is termed as related data and may be designated by R in the first or second column.

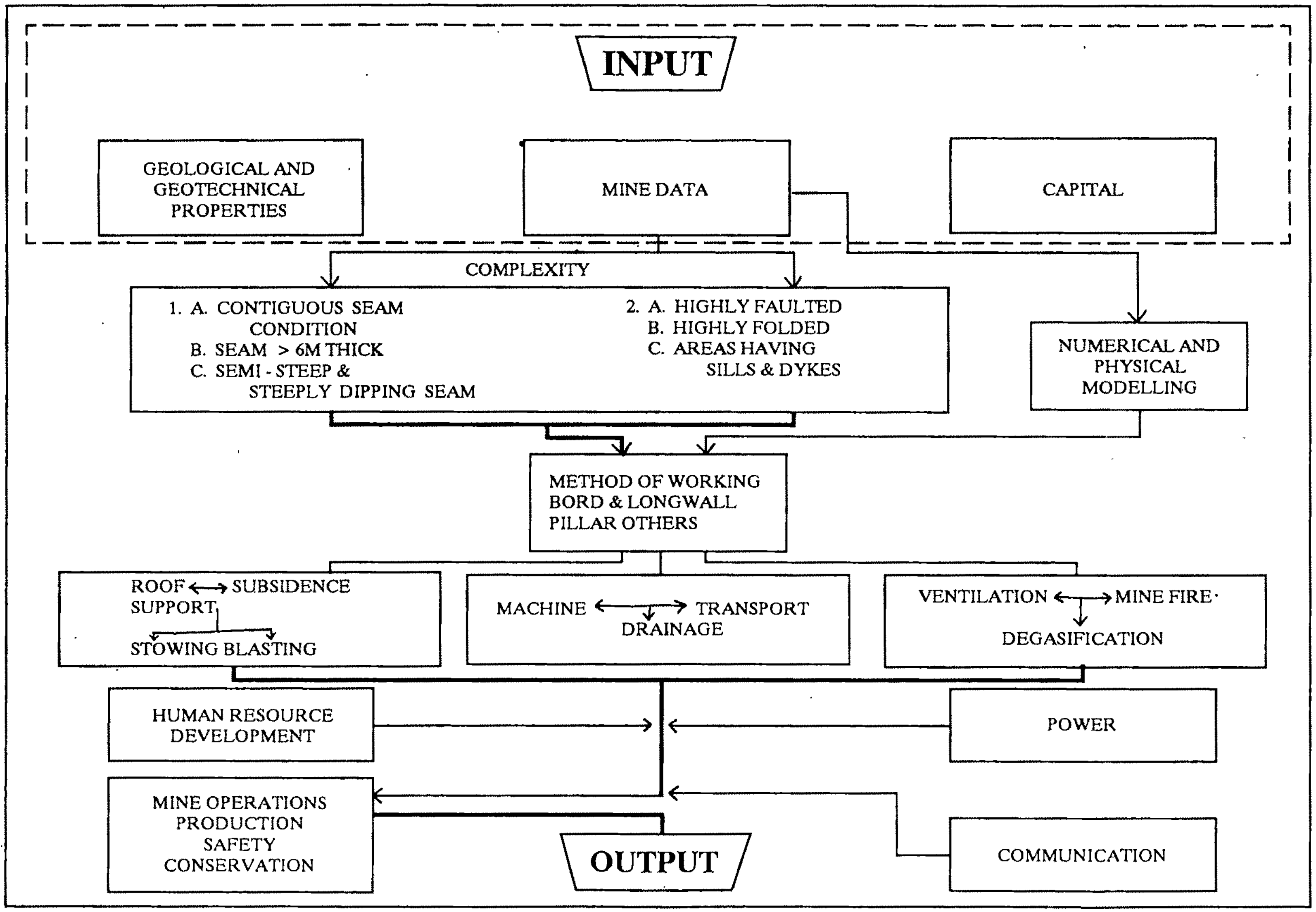
Local Data

Data, such as meter reading of electrical consumption to determine the payment of electrical charges by the individuals occupying the staff quarters is not related to any other activity. Even the finance department would be interested only in the actual amount to be recovered and not the meter reading. Such data may be designated by L and may be considered as local data.

---

* For other specific work, depending upon research activities fairly powerful computers all the way upto super computers may be used. This powerful computer may be other than the master computer mentioned above.

** Modular concept [10] of major Thrust Area Projects, particularly multi-disciplinary and multi-institutional projects was introduced in the laboratory. Typical modules for one project is shown in fig.6 as an example. Modular concept provides ease of working of the project and built-in-accountability.


INPUT
GEOLOGICAL AND GEOTECHNICAL PROPERTIES
MINE DATA
CAPITAL
COMPLEXITY
1. A. CONTIGUOUS SEAM CONDITION
B. SEAM > 6M THICK
C. SEMI - STEEP & STEEPLY DIPPING SEAM
2. A. HIGHLY FAULTED
B. HIGHLY FOLDED
C. AREAS HAVING SILLS & DYKES
NUMERICAL AND PHYSICAL MODELLING
METHOD OF WORKING BORD & LONGWALL PILLAR OTHERS
ROOF SUPPORT
SUBSIDENCE
STOWING
BLASTING
MACHINE
TRANSPORT
DRAINAGE
VENTILATION
MINE FIRE
DEGASIFICATION
HUMAN RESOURCE DEVELOPMENT
POWER
MINE OPERATIONS PRODUCTION SAFETY CONSERVATION
COMMUNICATION
OUTPUT

EXPLOITATION OF COMPLEX COAL DEPOSITS
FIG. 6

DATA FLOW SYSTEM

Data flow system was previously developed in the laboratory for efficient mine management [11-12]. This could be modified to suit the office automation. Basic concept lies in attaching headers and trailers to sets of data as shown in figure 5. Headers determine the level where the data is generated and the trailer determines the layers where it should go and the computers in each layer where the data is to be stored. When data moves up in the layer, header is increased by one and when it moves down it is decreased by 1. The header is matched with trailer to work out automatically the specific computers where the said data in each layer has to be stored. Thus, once the connectivity is thoroughly worked out, movement of data becomes automatic.

TOWARDS A PAPERLESS OFFICE

Once the network is established and data flow system is developed, databases will get updated automatically. With the availability of back up facility, need for keeping hard copies will be greatly reduced. Thus, one could move towards what is termed as paperless office. However towards this goal, the establishment of following aspects needs special attention and the work on these aspects is currently being carried out.

a) Knowledge base

b) Technical data bank

c) Decision support system

POSSIBLE ADVANTAGES OF ESTABLISHING OFFICE AUTOMATION

There are many advantages of creating office automation. However, major areas of benefit are listed below:

a) Optimisation of input to projects thereby creating atmosphere for improved outputs.

b) Establishing accountability down to individual working scientists level for better feedback in modifying research activities.

c) Quicker availability of information both administrative and scientific thereby reducing lead time in each project.

REFERENCES

1. BHUNIA C T and NAYAK C R : Ethernet, CSI Communication. November 1992, 5-12.
2. TANENBAUM A S : Computer networks. New Delhi, Prentice Hall of India Pvt. Ltd., 1986, 286-323.
3. CLARK D D, POGRAN K T and REED D P : An introduction to local area networks., New Delhi, Prentice Hall of India Pvt. Ltd., 1991.
4. MCNAMARA J E : Local area networks. New Delhi, Prentice Hall of India Pvt. Ltd., 1991.
5. GERLA M, and BANNISTER J A : High speed LAN's. IEEE Spectrum. August, 1991.
6. BERTINE H V : Physical level protocols. IEEE Trans Comm. 1980, 433-444.
7. COLE R : Computer communications. London, The Macmillan Press Limited, 1982, 156-168.
8. DAVIES D W, BARBER D L A, PRICE W L. and SOLOMIDES C M : Computer networks and their protocols. N.Y. , Wiley, 1980.
9. IYER S : Computer networks - an overview, CSI Communication. 1992, 13-20.
10. Peer review document of Central Mining Research Station, Dhanabad, May 1992.
11. SRIVASTAVA S C, BANDYOPADHYAY L K and SRIVASTAVA S: Computer aided mine management system for increase in production and productivity in Indian mines. Seminar on Computer Aided Production Engineering, Jadavpur University, Jan. 1987.
12. Grants-in-Aid Project Report funded by Deptt. of Coal, CMRS, Dhanabad on development of sensors and microprocessors based switching for intrinsically safe power for underground mines, 1992.

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SELECTIVE DISSEMINATION OF INFORMATION (SDI): A CASE STUDY OF CENTRAL WATER AND POWER RESEARCH STATION (CWPRS)

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A computer based SDI service rendered at the Central Water and Power Research Station (CWPRS), Pune using HP 3000/Series 58 computer and MINISIS software is described.

INTRODUCTION

One of the major functions of a library is to scrutinise publications immediately after receipt, make a selection of publications pertinent to the programme of the organisation and bring individual item to the attention of the user to whom it concerns. This is generally known as "Current Awareness" service that is directed to the community of scientists as a whole or in groups. A refinement of current awareness service is the Selective Dissemination of Information (SDI) service.

SDI is an information alerting service designed to keep individuals informed of new developments in their particular fields of interest by providing at regular intervals a listing of citations to newly published literature, based on predefined topics of interests commonly known as profiles. In general, the reason for introducing SDI service is that the rapid growth of technological and social changes requires the relevant information to be instantly made available to the scientists. The problem gets further accentuated by information explosion. Researchers are conscious of the possibility of being unaware of the work done previously on the relevant areas.

Another strong argument in favour of supporting SDI service especially in developing countries is related to cost-effectiveness. Many national institutes in developing countries don't have sufficient funds and foreign exchange to subscribe to on-line services or to the multitude of scientific journals required by the users. In this case, the provision of SDI services on a wider scale (e.g., through networks) and acquiring articles based on user requests, will enable the libraries to give their users access to international literature at a reasonable cost.

CENTRAL WATER AND POWER RESEARCH STATION (CWPRS)

The CWPRS established in 1916, is the premier national institute devoted to the development of water and energy resources and the waterborne transport. The research station employs over 2000 personnel out of whom about 500 are engineers and scientists. The research and development services offered by CWPRS encompass the entire life cycle of water right from its occurrence to mixing with ocean with specific emphasis on water use on the one hand and prevention of water related disasters on the other. The CWPRS activities are divided into the following 10 disciplines:

- Hydrology and water resources analysis
- River engineering
- Reservoir and appurtenant structures
- Ship hydrodynamics
- Coastal and offshore engineering
- Foundations and structures
- Hydraulic machinery
- Applied earth sciences
- Mathematical modelling
- Instrumentation and control engineering

The CWPRS library was established in 1938 with the objective of making available the literature relating to the disciplines of activities of CWPRS. The library is procuring books, periodicals, reports and related materials for its clientele. Presently the library caters to the needs of over 500 scientists and engineers, with a holding of over 45,000 books, reports, standards and a subscription of over 500 national and international journals.

INFORMATION NEEDS

The information needs at CWPRS vary from person to person as they are involved in different projects relating to the above disciplines. To compile information needs of CWPRS engineers/scientists, profiles are collected in the form of a questionnaire (Appendix-A). The questionnaire is designed in two parts: Part I relates to the personal data of the user to be stored in user database, Part II relates to information about current research work. This includes the titles of research projects handled by the user, the topics of special interest to him, the list of journals frequently consulted by him and the list of authors of his interest and the keywords in his subject area.

More than one hundred questionnairs were circulated to identify the interests of individuals in the form of keywords and other elements. The information was then transformed into machine readable format and stored in search fields of profile database. Boolean operators such as AND, OR, NOT are used in formulating the search strategies.

SDI service has been introduced for the engineers and scientists in 1988 using HP 3000/ series 58 computer system and MINISIS software. Presently the SDI service is rendered to over 100 senior engineers and scientists in CWPRS and over 50 other research institutions working in the same field.

HEWLETT PACKARD 3000/SERIES 58 COMPUTER SYSTEM

The HP 3000/series 58 minicomputer system, installed at CWPRS has the following configuration:

Hardware

Disc drives	2 x HP 7937 H (571 MB)
Mag tape drives	2 x HP 7380 A (6250/1600 cpi)
Cartridge tape drives	1 x HP 9144 A
Printers	2 x HP 2563 B (300 lpm) 1 x HP 333440 Au (laser jet)
Terminals	12 x C 1001 A
Personal computers	2 x HP 150 II

The system has Multi Programming Executive (MPE) operating system and supervises the processing of all programs that run on HP 3000. MPE monitors and controls program input, compilation, run preparation, loading, execution and output. In addition, MPE coordinates all user interaction with the system, providing an easy to use command language interface and a powerful programmatic interface in the form of intrinsic and a versatile file system.

MINISIS SOFTWARE

MINISIS is an information management system developed by the International Development Research Centre (IDRC) to run on any of the HP 3000 series of minicomputers. It was originally developed to permit the management of bibliographic databases. However, it is used to fill the need for the management of library tasks on a minicomputer. Some of the innovative features include:

- Interactive terminal-oriented use by many users at different levels of sophistication;
- Control of user functions through interactive management processor, without any programming or program intervention;
- Multi-lingual, multi-character set capability, for data bases and user dialogue;
- Ability to provide user dialogue in different languages, with English, French and Spanish currently supported by IDRC, and Arabic supported by the documentation centre of the Hu Arab League (Tanis/Tunisia);
- Data distribution in international standard format (ISO 2709-1973);
- Security system to control processor and data base access;
- Simultaneous data base access, with online updating;
- Support of relational database concepts to allow sharing and standardization of common information;
- interactive QUERY processor with Boolean operators and a multi-lingual thesaurus;and

SDI capability.

The user of the MINISIS will normally refer to the following terminology:

Field	:	An elementary piece of data which is an occurance of a domain
Repeating field	:	A field which may occur more than once in a record
Subfielded field	:	A field which has more than one distinct components
Record	:	A group of fields accessed as a single unit
Database	:	A collection of records composed of particular fields, accessed through a MINISIS logical structure
Authority file	:	A collection of records containing all possible values a field may assume

In MINISIS, a database is described in terms of certain attributes, including:

a) The name of the database

b) A list of the fields in a record of the database

c) A description of each field including:

- long name of the field
- short mnemonic for the field
- subfields of the field
- repeatability of the field
- prompting control for data entry
- definition of consistency checks on that field, perhaps against authority files.

d) Specification of any ordered access paths to the database, and the fields on which these access paths are realized

e) Any security provisions associated with the database

f) A default display specification

g) Transaction logging requirements, etc.

h) Internal Sequence Number (ISN) : Each record in the master file has a unique ISN associated with it. The ISN may be generated automatically when the record is entered, or it may be assigned by the user at entry time. Once ISN has been assigned to a record, it never changes. A record in a Master File is always accessed by its ISN directly or indirectly.

Fast Access (inverted) Files

In MINISIS the quick route or fast access path is an inverted file and the common characteristic is the contents (or partial contents) of one or more fields in the record. An inverted file in MINISIS is a directory file containing keys and a list of records in master file from which these keys are extracted, or in other words which contains these keys. There are a number of different extracation procedures (to extract the whole field, individual works, descriptors between the slashes, etc.) available for extracting information. Since there may be many records containing a key, the list of records is actually stored in one of the special internal forms called either a "bit string" or an "integer string". The bit string is simply a compact way of storing many ISNs. The integer string is simply a list of ISNs. These lists are sometimes referred to as "postings".

When the user requests records containing some particular key, for example within the QUERY processor, MINISIS looks up that key in the inverted file, and then gets the list of records associated with it. This list of records can be manipulated in certain ways, using Boolean operators with other lists, and to access the master records in question.

In MINISIS, three regular Relational Databases (RD) viz. USER, STORE and PROFILE which will be joined through a Data Submodel (DS) for use by SDIPRINT processor are to be defined to provide SDI service. It may be noted that the names USER, STORE and PROFILE are used as terms to identify and define the type of database under use. Four databases, viz. a) ARTIND, b) SDIUSER, c) SDIPROF and d) SDIDS have been created for providing SDI service.

i) ARTIND - Store database

The store database - ARTIND has fields for bibliographical details of articles (Appendix-B). The bibliographical details of articles collected from technical journals are stored in this database. On an average about 500 entries are added in the database monthly. Presently, there are over 38,000 records available for search. It is possible to search database on title, keywords, year of publication, title of the journal, author, etc. These fields are inverted for quick access.

ii) SDIUSER-User Database

The user database SDIUSER contains information about the user to whom SDI service is to be provided. This database has three fields viz. user name, user address and the number of profile copies (Appendix-C). The SDIUSER records are printed as the header information by SDIPRINT alongwith retrieved record sets. There are presently over 100 records in this database. This number also indicates the potential users of SDI service.

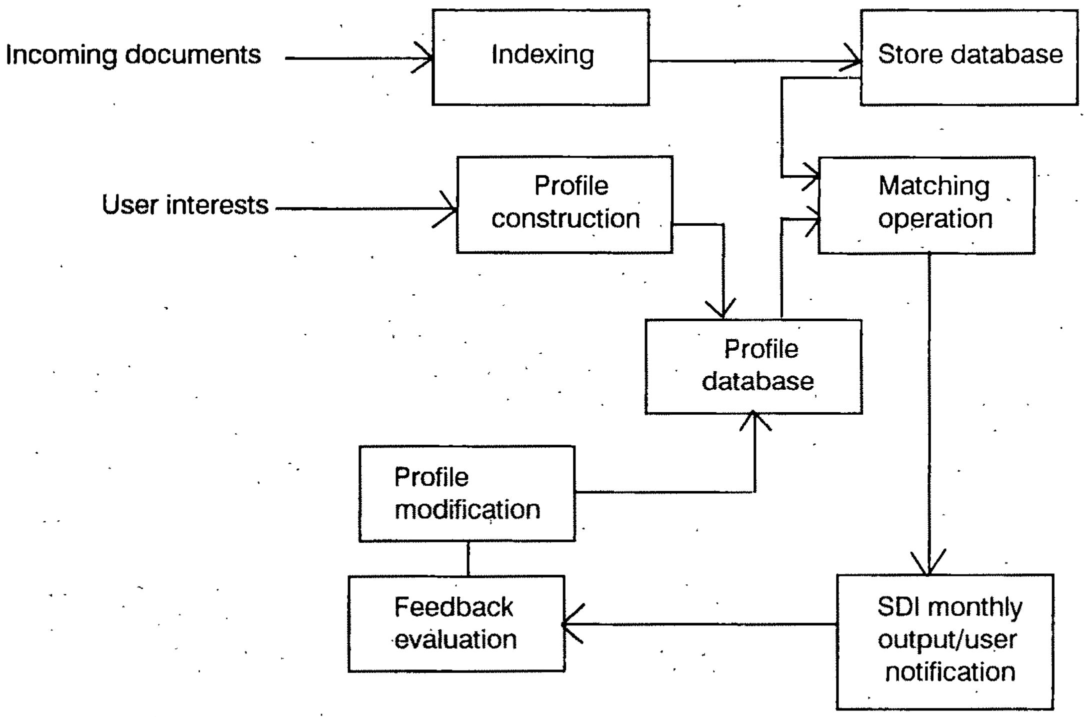
iii) SDIPROF-Profile Database

The profile database - SDIPROF is designed to make the search strategy as broadly as possible in order to ensure that the information relevant to the user's needs will be retrieved. Further, it is possible to narrow or broaden the strategy as required by the user. In this database search line field will hold the search queries to be applied against the STORE database. When the profile is executed, the contents of this field will be treated by MINISIS and relevant information is retrieved.

Profile database has 17 fields (Appendix-D) in which user profiles (collected in the form of questionnaire) are stored in a machine readable form. There are over 100 profiles available in this database.

iv) SDIDS-Data Submodel (DS)

A data submodel which joins the STORE, PROFILE and USER databases is used by the SDIPRINT processor to produce SDI output. The SDIDS data submodel prints output in the following sequence: USER database i.e. SDIUSER, PROFILE database i.e. SDIPROF and STORE database ARTIND (Appendix-E).



Schematic Diagram Illustrating SDI Service

EXECUTION OF PROFILE

The data collected through questionnaires, are compiled and interpretted into search expressions. Due attention is given to the concepts contained in the profile, the database on which the profile should be run and the boolean operators ADJ, IGN, NOT, AND, OR, EOR. The search takes place through free-text language.

The search expressions are tested on-line with QUERY processor using the *XEQ(TEST) or *XEQ(SYNTAX) commands. The execution of SDI jobs or profiles is carried out via four commands in the QUERY processor: *SETSDI, *EDIT, *OUTPUT and *XEQ.

Every month user profile is put to run against selected store database through QUERY module of MINISIS software. Matching takes place automatically between the user profile and the document profile. The outcome of the search is sent to concerned user along with a feedback form (Appendix-F) to indicate any modifications needed in the profile.

USER FEEDBACK

On receipt of SDI output, the user indicates the references for which full papers are required. Subsequently, xerox copies of the same are supplied. In case of profile modification, keywords are crosschecked with the existing ones and the profile is modified by adding new terms.

The CWPRS library caters to the information requirements of over 100 users through SDI service. The efficiency and effectiveness of such a service is evaluated. The evaluation measures actually used are based on the standard recall and precision devices where the recall (R) is defined as the proportion of relevant material retrieved and the total relevant materials in the collection and the precision (P) is the proportion of retrieved relevant material and the total retrieved material. This may be defined as:

$$R = \frac{\text{Number of items retrieved and relevant}}{\text{Total relevant in collection}}$$

$$P = \frac{\text{Number of items retrieved and relevant}}{\text{Total retrieved from the collection}}$$

To evaluate the service, feedback from all users is collected and analysed using the above principles. Using random technique 18 profiles were identified for study and the values of recall and precision were calculated. The mean recall 'R' was obtained to be 61.18; and mean precision 'P', 64.89. Overall, it is indicated that:

a) for some profiles precision rate is low and recall rate is high

b) and in other profiles it is vice versa

In such a situation, identification of user profiles is done through personal discussions. Accordingly, the individual users are contacted and their profiles modified before undertaking subsequent searches.

CONCLUSION

This paper presents a case study of SDI service provided by CWPRS library involved in research and development activities of water resources area. An HP 3000 computer system together with MINISIS software is found to be adequate in creation of required databases and in rendering current and comprehensive information services to user clientele. The databases used for providing SDI is also used for undertaking retrospective searches. The user-feedback study indicated that by and large the service is catering to the information needs of CWPRS scientists and engineers. This service is also being extended to the institutions functioning in the fields of hydraulics and allied subjects in India.

ACKNOWLEDGEMENT

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REFERENCES

1. WAVING S : Current awareness service and the information centre. ASLIB Proceedings. 1991, 43 (10), 299-303.

2. INTERNATIONAL DEVELOPMENT RE-

SEARCH CENTRE (IDRC), Ottawa, Canada: MINISIS Manual, 1988.

3. CHANDEL A S : Current awareness service and selective dissemination of information from periodical literature. Lucknow Librarian. 1981, 20, 147-151.

4. MISRA V N : Selective dissemination of information at Central Mechanical Engineering Research Institute. *In* IASLIC Special Publication No. 11, Calcutta, 1988, 34-46.

5. LUHN H P : Selective dissemination of information of new scientific information with the aid of electronic processing equipment. American Documentation. 1961, 12, 131-138.

6. SALTON G : Dynamic information and library processing. Englewood cliffs, Prentice-Hall, 1975, 115-159.

APPENDIX-A

QUESTIONNAIRE

1. PERSONAL DATA :

Name :
(Surname) (First Name) (Middle Name)

Designation :

Division :

Field of Specialisation :

II. CURRENT RESEARCH WORK :

(a) Please give below list of research projects you are presently working on :

(b) Please list below research papers published on current research studies:

(c) Please give below your subject/topic of special interest:

(d) Please give below a list of technical journals frequently used by you in connection with your research project :

(e) Please give names of the authors whose articles/books are relevant to your present research work :

(f) Please list below all technical terms frequently used in your present research work :

(g) Any other information/suggestion :

Signature :

Date :

APPENDIX-B

```
WED, OCT 7, 1992             LISTDDT DATA DEFINITION                                                                        PAGE 1
                                               O   L   N D  R S P M D B V P I I I I I N   T L   S S A    I    L V    A    E
                                               F   E   U E  E U R A U I A R N N N N N U   Y E   T T N    N    O A    R    X
                                               F   N   M C  P B O N P B L I V V V V V M   P N   R P Y    V    G L    G    I
                                               S   G   E    E F M D     I M                     I                         T
                                               E   T   R P  A L P T C L D   O R O T T E   E E   P F F    F    C F    N
F I E L D   N A M E             MNEMONIC  TAG  T   H   I L  T D T O H V A K N E F Y H X   X X     I I    I    H I    A
                                                       C      E   R C L T E   L F P E T   T T   O L L    L    G L    M
                                                              D   Y K   E Y       E S R   R R   P E E    E      E    E
----------------------------------------------------------------------------------------------------------------------------------
*** Database : ARTIND

TITLE                              TITLE  T100 -1  225          Y           Y     B   20  W 20    3      T1T2
AUTHOR                             AUTHOR A100 -1  30       Y   Y           Y     B   1     30           A2A2
TITLE OF THE JOURNAL               TIJL   J100 -1  100          Y           Y     B   1     100          JJJJ
VOLUME                             VOL    V100 -1  10           Y
ISSUE NO                           ISSNO  S100 -1  10           Y
PAGINATION                         PAGIN  P100 -1  15           Y
DATE OF PUBLICATION                MONTH  M100 -1  15           Y
YEAR                               YEAR   E100 -1  10           Y           Y     B   1     10           YYYY
KEYWORD                            KW     K100 -1  40       Y   Y           Y     B   1     40           KKKK
ABSTRACT                           ABST   B100 -1  1000         Y
PROFILE LINK                       PROLIN Z990 -1  10
ENTRY DATE                         ENTRY  D100 -1  20           Y           Y     B   3   W 10           D333
```

APPENDIX-C

```
WED, OCT 7, 1992             LISTDDT DATA DEFINITION                                                                        PAGE 1
                                               O   L   N D  R S P M D B V P I I I I I N   T L   S S A    I    L V    A    E
                                               F   E   U E  E U R A U I A R N N N N N U   Y E   T T N    N    O A    R    X
                                               F   N   M C  P B O N P B L I V V V V V M   P N   R P Y    V    G L    G    I
                                               S   G   E    E F M D     I M                     I                         T
                                               E   T   R P  A L P T C L D   O R O T T E   E E   P F F    F    C F    N
F I E L D   N A M E             MNEMONIC  TAG  T   H   I L  T D T O H V A K N E F Y H X   X X     I I    I    H I    A
                                                       C      E   R C L T E   L F P E T   T T   O L L    L    G L    M
                                                              D   Y K   E Y       E S R   R R   P E E    E      E    E
----------------------------------------------------------------------------------------------------------------------------------
*** Database : SDIUSER

USER NAME                          USENAM U020 -1  40           Y           Y     B   1     40           NAME
USER ADDRESS                       USEADD U030 -1  100          Y
NUMBER OF PROFILE COPIES           NUMCOP U040 -1  2   Y 0      Y
```

APPENDIX-D

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WED, OCT 7, 1992             LISTDDT DATA DEFINITION                                                                        PAGE 1
                                               O   L   N D  R S P M D B V P I I I I I N   T L   S S A    I    L V    A    E
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                                               E   T   R P  A L P T C L D   O R O T T E   E E   P F F    F    C F    N
F I E L D   N A M E             MNEMONIC  TAG  T   H   I L  T D T O H V A K N E F Y H X   X X     I I    I    H I    A
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SEARCH LINE NUMBER                 LINNUM P301 -1  5   Y 0      Y
SEARCH LINE                        SEALIN P302 -1  180          Y
LINE WEIGHT                        LINWT  P303 -1  3   Y 0      Y
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APPENDIX-E

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WED, OCT 7, 1992      LISTDDT DATA DEFINITION                                                         PAGE 1
                                          O  L    N D R S P M D B V P I I I I I N  T L  S S A  I  L V  A  E
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                                          S  G    E   E F M D     I M                  I                 T
                                          E  T    R P A L P T C L D   O R O T T E  E E  P F F  F  C F  N
F I E L D   N A M E         MNEMONIC TAG  T  H    I L T D T O H V A K N E F Y H X  X X    I I  I  H I  A
                                                  C     E   R C L T E   L F P E T  T T  O L L  L  G L  M
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AUTHOR                        AUTHOR A100 -1 30       Y   Y           Y     B   1    30        A2A2
TITLE OF THE JOURNAL          TIJL   J100 -1 100          Y           Y     B   1    100       JJJJ
VOLUME                        VOL    V100 -1 10           Y
ISSUE NO                      ISSNO  S100 -1 10           Y
PAGINATION                    PAGIN  P100 -1 15           Y
DATE OF PUBLICATION           MONTH  M100 -1 15           Y
YEAR                          YEAR   E100 -1 10           Y           Y     B   1    10        YYYY
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LIBRARY AND INFORMATION SERVICE FACILITIES IN MANGALORE UNIVERSITY LIBRARY FROM THE RESEARCH SCHOLARS' POINT OF VIEW : A SURVEY

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The relevance and dependability of users study are diescribed. An attempt is made to elicit opinions from the research scholars as the users of the Mangalore University Library. A questionnaire is used to make a survey of the use of information service facilities of the university library. The analysis of the data thus collected, covers the use of the library collection, library catalogue, library service facilities, etc. and the information needs of the users of the library. Finally, it highlights the suggestions made by the research scholars for the future planning of the library.

INTRODUCTION

An adequate knowledge about the users and their demands is necessary to make the library and information services more effective. Survey is a means for the systematic study of the characteristics of the existing system and behaviour of research scholars using the system and its services. The key concepts in the user studies are the information needs and the information seeking behaviour of the users. The present study is mainly concerned with information search activities of research scholars - their information needs, use behaviour and use pattern. It also helps to find out the extent to which the existing library has organized and disseminated information to suit the needs of the users.

OBJECTIVES OF THE STUDY

The primary objective of the study is to investigate the existing library and information service facilities in the university library, Mangalore for the year 1992-93. The specific objectives of the study are as follows:

a) to find out the types of information sources required by the research scholars;

b) to find out the information needs of the research scholars;

c) to find out the communication channels through which information is acquired by the research scholars;

d) to identify the methods that the readers of the library adopt to locate the required information sources;

e) to ascertain the opinion of the users regarding the adequacy of information resources and services available in the library;

f) to identify the problems faced by the users in using the library; and

g) to help the administrator of the library in preparing an enrichment program for better use of the library.

METHODOLOGY

A questionnaire consisting of 17 questions was designed to elicit the opinions of the research scholars. These were distributed among the scholars and the required data was collected which was further supplemented by informal discussions with the research scholars. The analysis and interpretation of the data is presented.

ANALYSIS

The total strength of research scholars according to the official sources was 95. The questionnaires were distributed among the selected group of 60 scholars. Out of which 44 (73.3%) scientists responded.

USE OF LIBRARY

The university is an apex centre imparting higher education and promoting research activity. The use of library could be measured in several ways. One such way, which may give an idea of the use of the library, is the frequency of the visits of users to the library.

Table 1

Frequency of Visits to the Library

Sl. No.	Frequency of library visit	No. of responses	Percentage of response
1.	Daily	20	45.4
2.	Once in a week	3	6.8
3..	Twice a week	16	36.4
4.	Once in 15 days	-	-
5.	Once a month	-	-
6.	Occasionally	5	11.4
	Total	44	100.0

It is evident from Table 1 that the majority of research scholars visited the library daily to meet their information needs. Further, about 36.4% of the researchers visited the library twice a week. The number of users, who visit the library once a week, once in 15 days or once a month was negligible.

However, it is not the frequency of visit, but the purpose of the visit to the library is an important criterion to measure the use of the library. It gives necessary information to the library authorities about the documents and the type of information that the library users are interested in. This helps them in developing need based document collection and also in developing other services and facilities to give better service to its readers. Table 2 attempts to identify the purpose of users' visits to the library.

Table 2

Purpose of Visit to the Library

Sl. No.	Purpose of library visit	No. of responses	Percentage of responses w.r.t. respondents
1.	Borrow books	38	86.4
2.	Consult periodicals	36	81.9
3.	Read news papers	28	63.6
4.	Use theses and dissertations	19	43.2
5.	Consult reference documents	26	59.1
6.	Use reports	13	29.5

It is evident from Table 2 that a majority of the researchers visited the library to borrow books followed by those who wanted to consult the periodicals. Thus, books and periodicals were found to be the most used resources in the library collection. Next in order were news papers and magazines. About 63.6% of researchers consulted the newspapers for their information needs. Theses and dissertations were used by 43.2% of researchers, reference documents 59.1% and the report literature was used by a 29.5% respondents. Thus, it may be inferred from the above facts that books and periodicals are the maximum used primary publications.

USE OF LIBRARY DOCUMENTS

The knowledge/information is brought out in a variety of forms such as books, periodicals, reports, theses and dissertations, newspapers etc. For a university library all these types of documents are important. Users use these varied kinds of information resources for their information needs. Table 3 indicates the preference of users towards various kinds of documents in Mangalore University Library.

Table 3

Users' Preference to Types of Documents

Sl. No.	Types of documents	Users' order of preference						
		1	2	3	4	5	6	7
1.	Periodicals	17 (38.6)	16 (36.4)	5 (11.4)	3 (6.8)	1 (2.3)	2 (4.5)	-
2.	Books	15 (34.1)	7 (15.9)	11 (25.0)	2 (4.5)	4 (9.1	5 (11.4)	-
3.	Abstracts/Indexes	9 (20.5)	9 (20.5)	3 (6.8)	9 (20.5)	5 (11.4)	5 (11.4)	4 (9.1)
4.	Reference books	2 (4.5)	9 (20.5)	17 (38.6)	10 (22.7)	5 (11.4)	-	1 (2.3)
5.	Theses and Dissertations	1 (2.3)	-	5 (11.4)	8 (18.2)	12 (27.2)	12 (27.2)	6 (13.6)
6.	Reports	-	3 (6.8)	2 (4.5)	7 (15.9)	8 (18.2)	18 (40.9)	6 (13.6)
7.	News papers and Magazines	-	-	1 (2.3)	5 (11.4)	9 (20.5)	2 (4.5)	27 (61.4)

The analysis of the responses furnished by the respondents in respect of their preferences to various kinds of information resources indicates that among others, periodicals, followed by books were the most preferred resources by the researchers. Next in order are the abstracts/indexes, references books, theses and dissertations and reports. Newspapers and magazines were the least preferred resources.

INFORMATION NEED OF USERS

Information is a basic resource for any kind of professional activity. Specific information is an objective demand of the user. The information needs may vary among users depending upon their nature of work. The study of users' approach to locate needed documents/information helps to improve the information service. Table 4 attempts to identify the methods used by the scientists in locating the needed documents/information.

Table 4

Methods Used in Locating the Needed Documents/Information

Sl. No.	Method	No. of responses	Percentage of responses w.r.t. respondents
1.	Assistance of the library staff	28	63.6
2.	Consulting catalogues	32	72.7
3.	Guidance of teachers	3	6.8
4.	Help of friend	5	11.4
5.	Guides	9	20.5
6.	Self	16	36.4

Table 4 demonstrates that the researchers locate the needed documents/information by consulting catalogues (72.7%), seeking assistance from the library staff (63.6%) and on their own (36.4%). The above analysis reveals that the library catalogues and the assistance of the library staff were the primary means to locate documents needed by the researchers. Though the respondents have other approaches such as help from friends, teachers and their research guides, they were not found to be popular among them.

In this study the majority of the respondents (52.3%) expressed that they faced a number of problems in locating documents/information in the library. Further, about 47.7% of respondents have expressed that they did not face too much of difficulty in locating document/information in the library.

Some of the problems encountered by the users of the university library are as follows :

1. Classification system used is not easy to follow.
2. Lack of proper guide boards.
3. Documents are not properly arranged on shelves.
4. Lack of proper bibliographical tools.
5. Lack of adequate staff.

6. Issue records do not help in quick identification of the books issued out.

Therefore, it is suggested that the library authorities must take a note of these problems and make efforts to solve them for the satisfaction of the users.

USE OF LIBRARY CATALOGUE

The users usually develop their own strategy for searching the documents required by them. The catalogue reflects the documents collection in the library and indicates where to locate them. The majority of respondents (42 out of 44) used the library catalogue to search and locate the required document which establishes the fact that a catalogue is an indispensable tool in a library.

The libraries usually maintain various sequences of catalogue such as classified sequence, author sequence, title sequence and alphabetical sequence of the catalogues. It was considered worthwhile to study what forms of catalogues the users like to approach.

Table 5

Users' Approach to Library Catalogue

Sl. No.	Type of library catalogue	No. of responses	Percentage of responses w.r.t. respondents
1.	Subject	24	54.5
2.	Author	31	70.5
3.	Title	21	47.7
4.	Classified	2	4.5
5.	Series	1	2.3

Table 5 demonstrates that the majority of researchers (70.5%) followed author approach to find the documents. The next in order were subject and title approaches (54.5% and 47.7%) respectively, whereas the classified catalogue and series catalogue were given lesser importance.

Library catalogue is an effective tool which provides accesss to the collection of the library and promotes its use. Hence knowledge about the consultation of library catalogue is essential for the users. Since, many readers might not have the experience of using the library catalogue, it is essential for the university libraries to offer proper training to the users.

Users' opinion regarding guidance in using library catalogues showed that a majority of researchers (30, 68.2%) had taken guidance in the use of library catalogues. Further, another interesting feature is that about 31.8% of researchers did not take any help while using the library catalogue.

Table 6

Sources of Guidance for using Library Catalogue

Sl. No.	Source	No. of responses	Percentage of responses w.r.t. respondents
1.	Library Staff	23	52.3
2.	Friends	6	13.6
3.	Teachers	6	13.6
4.	Guide	5	11.4
5.	Chart in the library	2	4.5

Table 6 shows that a majority of researchers (23 representing 52.3%) got the guidance from the library staff for using library catalogue. Followed by this are 6 researchers representing 13.6% of the total respondents, who got the assistance from their friends or teachers. This fact makes it clear that the use of library catalogue depends basically on the help provided by the library staff.

LIBRARY COLLECTION

An important function of the university library is to cater to the needs of the postgraduate students, research scholars and the teaching members of the university. This class of readers need highly specialized and advanced material on the subject of their specialization which consist of a variety of information sources like books, periodicals, reports, encyclopaedias, dictionaries, handbooks, yearbooks, directories, bibliographies, abstracting and indexing journals, theses and dissertations, monographs, news papers, magazines, etc.

It was, therefore, considered appropriate to know whether the existing collection of Mangalore University Library is adequate enough to meet the information requirements of its readers in their academic, research and development and publication work.

The details furnished in Table 7 shows that the opinion expressed by a majority of researchers (38.6%) is that the collection of books was partially adequate to meet their information needs, whereas the periodical collection was totally inadequate. Hence the periodical collection calls for the serious attention of the authorities. Similarly the collection of reports and conference proceedings was also inadequate to fulfil the needs of the readers.

Regarding reference documents majority of respondents among researchers have no complaints. Further, analysis shows that the collection of some of the reference sources such as dictionaries, handbooks, year books, bibliographies, etc. needs strengthening. The number of newspapers and magazines were reported to be adequate by a majority of respondents.

Another important finding is that while a majority of researchers (34.1%) specified that secondary periodicals are partially adequate, 25% of researchers found them inadequate. Thus, the number of secondary periodical literature too is not sufficient enough to meet the needs of users.

Table 7

Adequacy of Library Collection

Sl. No.	Type of collection		Adequate	Partially adequate	Inadequate	Not responded
1.	Books		13 (29.5%)	17 (38.6%)	14 (31.9%)	-
2.	Periodicals		10 (22.7%)	15 (34.1%)	19 (43.2%)	-
3.	Reports		4 (9.1%)	12 (27.3%)	15 (34.1%)	13 (29.5%)
4.	Conference proceedings		2 (4.5%)	13 (29.5%)	17 (38.6%)	12 (27.3%)
5.	Research reports		6 (13.6%)	8 (18.2%)	20 (45.5%)	10 (22.7%)
6.	Reference Documents					
	a)	Encyclopaedias	22 (50.0%)	15 (34.1%)	-	7 (15.9%)
	b)	Dictionaries	22 (50.0%)	12 (27.3%)	2 (4.5%)	8 (18.2%)
	c)	Handbooks	14 (31.9%)	10 (22.7%)	9 (20.4%)	11 (25.0%)
	d)	Year books	12 (27.3%)	11 (25.0%)	10 (22.7%)	11 (25.0%)
	e)	Directories	14 (31.9%)	8 (18.2%)	10 (22.7%)	12 (27.3%)
	f)	Bibliographies	14 (31.9%)	10 (22.7%)	7 (15.9%)	13 (29.5%)
	g)	Monographs	6 (13.6%)	18 (40.9%)	-	20 (45.5%)
	h)	Text Books	16 (36.4%)	14 (31.8%)	9 (20.4%)	5 (11.4%)
	i)	Abstracting and indexing journals	10 (22.7%)	15 (34.1%)	11 (25.0%)	8 (18.2%)
	j)	News paper	29 (66.0%)	6 (13.6%)	3 (6.8%)	6 (13.6%)
	k)	Magazines	24 (54.6%)	10 (22.7%)	4 (9.1%)	6 (13.6%)
	l)	Maps & atlases	17 (38.6%)	10 (22.7%)	7 (15.9%)	10 (22.7%)

AVAILABILITY OF CURRENT PERIODICALS

The nascent thought of the authors and the latest developments, improvements and innovations in various fields are generally published in periodical literature. It is, therefore, important to collect such information as quickly as possible to make it available to the researcher. It is, therefore, imperative that the periodicals must be received in time or at least as early as possible. Majority of researchers state that the current journals are not available on time. Hence, the availability of current periodicals calls for serious attention of the library authorities to receive them on time to meet the requirement of the users.

LIBRARY SERVICE

The prime objective of collection, storage and organization of information in the university library is to facilitate the academic community to exploit and harness fully the resources of the library. To this end, the library invites the reader, guides him and provides him with literature in a satisfactory manner. Effective library services make a library more functional to deliver the right information at the right time in the right manner to the right user. The modern academic libraries are required to use modern information techniques and services.

Table 8

Rating of Satisfaction with the Library Services

Sl. No.	Library & Information Service	Satis-factory	Unsatis-factory	Not responded
1.	Reference service	30 (68.2%)	14 (31.8%)	-
2.	Circulation service	28 (63.6%)	12 (27.3%)	4 (9.1%)
3.	Current awareness service	12 (27.3%)	21 (47.7%)	11 (25.0%)
4.	Reader guidance/assistance	17 (38.6%)	13 (29.5%)	14 (31.8%)
5.	Inter library loan	13 (29.5%)	16 (36.4%)	15 (34.1%)
6.	Reprographic service	16 (36.4%)	25 (56.8%)	3 (6.8%)
7.	Microfilm/fiche reader service	10 (22.7%)	15 (34.1%)	19 (43.2%)

As evident from Table 8 the majority of researchers were of the opinion that reference and circulation services were satisfactory to meet their needs. A majority of respondents found that current awwareness service, inter library loan and microfilm reader service were not satisfactory. The reader guidance/assistance seemed to be quite familiar to the researchers (38.6%). Further, about 56.8% of the researchers were not found aware of the availability of reprographic service.

ARRANGEMENT OF LIBRARY COLLECTION

Acquisition of adequate resources in the library is essential but their proper arrangement to give maximum benefit to the user is more important. Hence, it was felt necessary to know the users' opinion regarding the arrangement of the library collection in Mangalore University Library.

Table 9

Arrangement of Reading Materials in the Library

Sl. No.	Type of documents	Satis-factory	Unsatis-factory	Not responded
1.	Text books	31 (70.5%)	10 (22.7%)	3 (6.8%)
2.	Periodicals/journals	25 (56.8%)	19 (43.2%)	-
3.	Books in stacks	30 (68.2%)	10 (22.7%)	4 (9.1%)
4.	Reference books	28 (63.6%)	16 (36.4%)	-
5.	Reports	18 (40.9%)	14 (31.8%)	12 (27.3%)
6.	Theses/dissertations	29 (65.9%)	10 (22.7%)	5 (11.4%)

It is clear from the empirical statistical details furnished in Table 9 that a large number of respondents expressed their satisfaction about the arrangement of documents of different types in the library. However, a significant number of respondents among researchers (36.4%) complained about the lack of proper arrangement of reference books. Similarly about 43.2% of researchers have expressed their dissatisfaction about the arrangement of periodical literature. Further, a significant number of researchers, i.e. 31.8% found the arrangement of report literature unsatisfactory.

Thus, based on the above observations, it is suggested that the library authorities should take into consideration the reactions/opinions expressed by the respondents to take suitable measures for arrangement of documents in the library.

LIBRARY FACILITIES

The library has to maintain cleanliness, proper ventilation, appropriate space for reading, and provide drinking water and toilet facilities. A good environment in the library with encouraging facilities provide a comfortable atmosphere for reading and using the library resources effectively.

It is evident from Table 10 that a majority of researchers were of the opinion that the library maintenance facilities such as cleanliness, lighting, ventilation, equipment and drinking water were satisfactory. Another important finding is that the majority of researchers (65.9%) expressed that the space available for reading was not satisfactory. Toilet and ventilation facilities were also not satisfactory according to the majority of the respondents, which, therefore, need attention of the authorities for improvement.

Table 10

Users' Opinion about Facilities in the Library

Sl. No.	Facilities	Satis-factory	Unsatis-factory	Not responded
1.	Space for reading	15 (34.1%)	29 (65.9%)	-
2.	Cleanliness	31 (70.5%)	11 (25.0%)	2 (4.5%)
3.	Lighting	35 (79.6%)	6 (13.6%)	3 (6.8%)
4.	Ventilation	25 (56.8%)	19 (43.2%)	-
5.	Equipments	28 (63.6%)	12 (27.3%)	4 (9.1%)
6.	Drinking Water	33 (75.0%)	9 (20.5%)	2 (4.5%)
7.	Toilet	21 (47.7%)	21 (47.7%)	2 (4.5%)

SUGGESTIONS

Suggestions, opinions and recommendations expressed by the respondents are listed below:

a) The time taken in providing services such as xerox, reference service, etc. needs to be reduced.

b) The collection of advanced books and journals in all disciplines should be strengthened to support study, teaching and research work.

c) Newspaper clipping service should be strengthened and current awareness service be initiated.

d) Inter library loan facilities should be improved.

e) Collection of reprints should be enhanced through exchange of reprints with authors.

f) Non-book materials collection should be strengthened.

g) Library should provide various documentation services to help researchers.

h) Computerization of library collection and other operations should be ensured to meet the users' need quickly and promptly.

i) Skilled manpower to handle computerized operations should be developed.

j) Latest books and journals should be kept for use immediately.

FINDINGS - AN OVERVIEW

A majority of respondents are reported to visit the library with the purpose of consulting periodicals, books, news papers and magazines and reference documents. Again, a majority of them (72.2%) locate their needed documents/information primarily by consulting catalogues and that 63.6% seek assistance from the library staff.

The study identifies that 52.3% of the respondents faced problems in locating documents/ information in the library. 70.4% respondents approach the documents through the author in the author catalogue. 23 respondents (52.2%) got their guidance from the library staff for using library catalogues.

The collection of the library must meet the needs of the users. In the library collection, the study identified that, books, encyclopaedias, dictionaries, news papers and magazines are sufficient to meet the academic and research needs, and that periodicals and report literature are not adequate enough to meet their academic and research needs. Hence, it is recommended to the library authorities that the above said library resources be improved and strengthened. Another important finding is that the majority of researchers (54.4%) have complained about the non-availability of current journals on time to meet their requirements in the library.

The majority of respondents were found to be aware of the services such as reference service and circulation service offered by the university library. But a good number of respondents have suggested that the other kind of services, such as current awareness service, inter library loan, reprographic service etc. are not satisfactory. Hence, it is suggested that university authorities take suitable measures to improve them.

While the opinions expressed by researchers regarding the environmental facilities in the library such as cleanliness, lighting, ventilation, equipments and drinking water, recorded a satisfaction, a good number of researchers find the space for reading and toilet facilities not adequate enough. Hence it is suggested to the library authorities that improvements in this direction are also much needed.

REFERENCES

1. BALASUBRAMANIAN S et al : Catalogue use study in National Medical Library (NML). Ann Lib Sci Doc 1985, 32 (1-2), 68-72.
2. DATTA N : Academic status for university and college librarians in India. Delhi, Indian Bibliographies Bureau, 1985.
3. HINGWE K S : Management of university libraries in India : principles and practices. Calcutta, World Press, 1982.
4. MALLAIAH T Y : Library and information service facilities in Mangalore University Library user's opinion: A study, (M.L.I.Sc. Dissertation) submitted to Bangalore University, Bangalore, 1992.
5. Mangalore University Handbook, Mangalagangothri, Mangalore University, 1990.
6. Mangalore University Library : Library Pathfinder. Mangalagangothri, Mangalore University, 1990.
7. PRASAD H N : Information needs and users. Varanasi, IBC, 1992.
8. PRASHER R G : Information and its communication. New Delhi, Allied, 1990.
9. SAHAI S N : Academic library system. New Delhi, Allied, 1990.
10. TALWAR V G AND PATIL R C : Collection development in university libraries in India - problems and prospects. In national policy for university libraries in India : problems and perspectives. ed. by N.B. Inamdar and L S RAMAIAH. New Delhi, Concept Publishing, 1989, 67-75.

BOOK REVIEW

S.R. RANGANATHAN (1892-1972). edited by Edward Dudley. London, Library Association, 1973. (The first Indian reprint with introduction by M.P. Satija, Guru Nanak Dev University, Amritsar, 1992)

The publication embodies a bouquet of papers presented by a selected band of the noted professionalists who had the distinction of belonging to the close circle of Dr. Ranganathan's colleagues, friends and associates. The papers are by way of a tribute to Dr. Ranganathan and were first read at a memorial meeting organized by the Library Association in London in January 1973 to pay homage to Dr. Ranganathan who had died in the preceding September. The authors, all from UK, comprise such distinguished authorities as B.C. Vickery, Director, School of Library, Archives and Information, University College London; A.J. Wells, Managing Editor, British National Bibliography; B.I. Palmer, Education Officer, Library Association, London; D.J. Foskett, Librarian, Institute of Education, University of London; H. Coblans, Managing Editor, Journal of Documentation; and D.W. Langridge, School of Librarianship, the Polytechnics of North London.

The papers present a fascinating first hand account of the various facets of Dr. Ranganathan's life and personalty including the profound impress he has left in the individual speciality areas like classification, indexing and bibliographical services. The text is characterized by its informative richness, literary elegance and lucidity of perception. Naturally in these pages, Dr. Ranganathan comes alive not only as a thinker, a planner, or a go getter but also as a man endowed with the best of human qualities by way of simplicity, humility, frugality and selflessness.

Dr. M.P. Satija of the Department of Library and Information Science, Guru Nanak Dev University, Amritsar who deserves to be complemented for his effort to bring out this first Indian reprint of the publication in synchronization with Dr. Ranganathan's birth century celebrations, has provided a highly emudate introduction to this work. A chronology of the major events in the life of Dr. Ranganathan starting with his date of birth (9 August 1892) compiled by Kate Wood of the Library Association and a subject index for speedy location of any intended piece of information are two other useful features.

The publication thus contributes a valuable source document for authentic information on Dr. S.R. Ranganathan and his contributions as perceived by the contemporary leading hights of the profession. It should be of immense interest and value to the libraries throughout the country apart from the ever groing fraternity of the admires of Dr. Ranganathan. For copies requests can be addressed to Dr. M.P. Satija, RIF 4, G N D University, Amritsar-143005, Punjab.

ERRATA

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